Scientific American.

A JOURNAL OF PRACTICAL INFORMATION IN ART, SCIENCE, MECHANICS, AGRICULTURE, CHEMISTRY, AND MANUFACTURES.

VOL. V.---NO. 6. NEW YORK, AUGUST 10, 1861. NEW SERIES

Improved Ditching Machine.

There is nothing more remarkable in the progress of our agriculture than the rapid extension, within the last few years, of the practice of draining land. The later volumes of the SCIENTIFIC AMERICAN contain numerous illustrations of improvements in the mole plow, which forms an underground drain without the use of tiles or other pipes to keep the passage open; and of various ditching machines that make a wide open ditch for digging ditches in soil of such character that it is necessary to employ tiles.

We now present an engraving of a very ingenious machine invented by Mr. F. B. Scott, of Buffalo, in this State, which is especially adapted to cut deep narrow trenches, say 6 inches wide and 4 feet deep; it is designed to save the vast labor which is expended in digging trenches in the ordinary manner, where the system of thorough drainage and the use of tiles is introduced.

The advantages of tile-draining are too well understood to need any extended remarks. The great difficulty in the way of its general adoption has been the expense of digging the trenches. This expense results not so much from the quantity of earth necessary to be removed to receive the pipe, as from the far greater quantity which has to be displaced to make room for the workman.

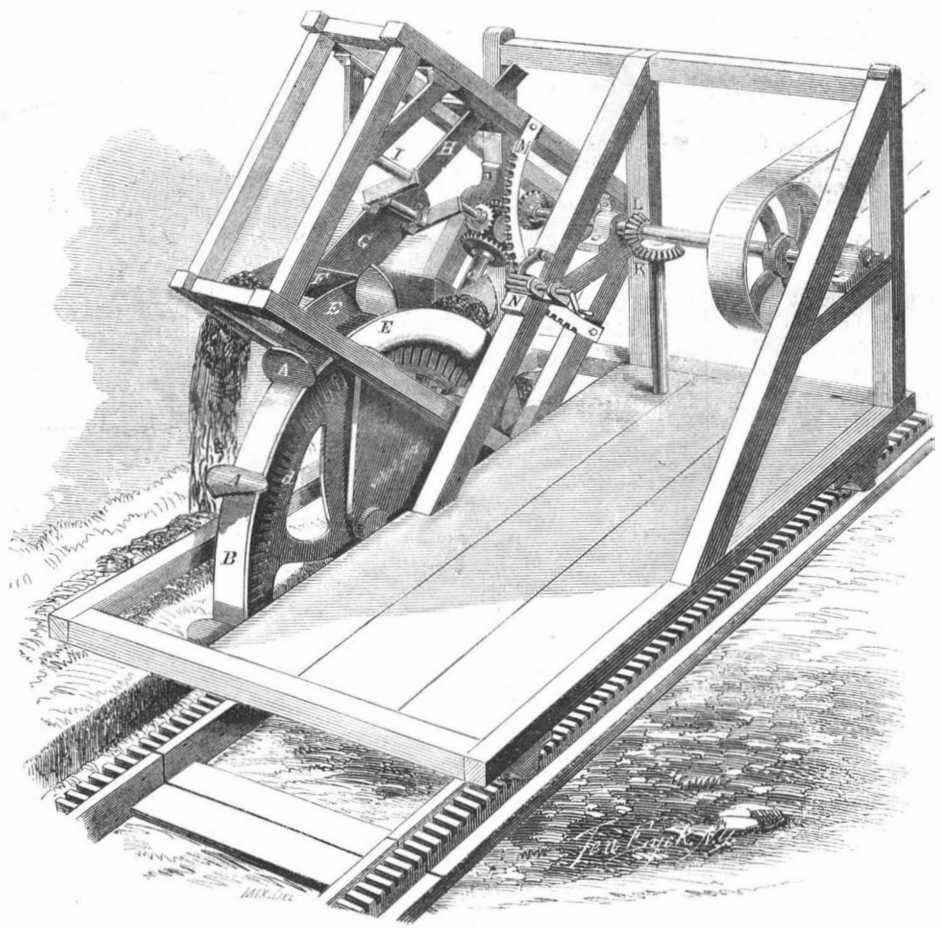
This machine may be operated by steam or other suitable power, and its motions, including its progress over the ground, are all automatic, so that the only attendance it requires is the moving of the track from the rear to the front as the machine slowly proceeds on its way.

The spades, A, are secured to the revolving wheel, B, which is carried around on its axis by means of a pinion on the shaft, *c*, meshing into the rack, *d*, on the inner side of the wheel's rim. As the spades bring up the earth, the latter is prevented from falling from off the wheel by two stationary shields, E E, and when the earth arrives opposite the spout, F, it is scraped out through this spout, and thrown beyond the ditch.

The peculiar motion of the scraper, G, is obtained by a simple and curious arrangement. Its upper part is narrowed into a bar, H, with parallel sides, and passed loosely through a slot in the stationary part of the frame, and its lower part is connected by journals to a crank on the shaft, I, so that as this shaft is rotated by the machinery, the scraper is brought down between the spades, carried outward through the spout, and then upward and over, ready to repeat the operation.

In order to keep this scraper itself clean, a stationary bar is fastened to the frame in such position that, as the scraper rises, its outer surface will be carried in close proximity to the bar, and thus any soil that adheres to the scraper will be removed.

The machine runs on small wheels which are geared to mesh into a rack, J, extending the whole length of the track, and it is carried slowly along by giving a rotary motion to one pair of the wheels through the medium of the shaft, K, which has a beveled pinion upon its lower end meshing into a similar pinion upon the axle. After the machine has passed from off one section of the track, this section is carried by hand in front of the section on which the machine rests, and placed in the line in which it is desired the ditch shall be excavated.



IMPROVED DITCHING MACHINE.

The frame which supports the spade wheel, B, is suspended on a fulcrum, L, concentric with the curved rack, M, so that the wheel may be raised or lowered, to adjust its elevation to the depth of the ditch desired, by turning the pinion, N, which meshes into the rack, M, this pinion being held in place by a pawl.

There are twelve spades on the wheel, which makes twelve revolutions per minute, and each spade cuts at an advanne of half an inch; giving six inches advance at a revolution, or six feet in a minute, or nearly 220 rods per day. Deduct one-third for stoppages, and we have say 150 rods per day with a two horse power and three men to attend, for a ditch four feet deep, which would take from 30 to 40 men to accomplish in the same time by manual labor.

This machine may be operated by a small steam engine, or by an endless-chain railway horse-power. The power is not attached in front but is carried aboard the machine, and is connected with the machinery by a broad belt. In case the spades should strike a stone the belt would slip before the machine would break.

The machine cuts the whole depth by once going over the ground, and consequently, if it cuts 150 rods, in a day it only travels 150 rods to do that amount of work. The track holds it up to the work, and also assists in giving regularity to the sides and bottom of the trench.

The wheel, the gearing and the axle are all within the line of the outer edge of the spades, to admit the wheel into the trench the greatest possible depth. In consequence of this arrangement a wheel five feet in diameter is sufficient for a machine designed to cut trenches four feet in depth.

The spade-wheel can be raised and lowered without stopping the machine or throwing any part out of gear.

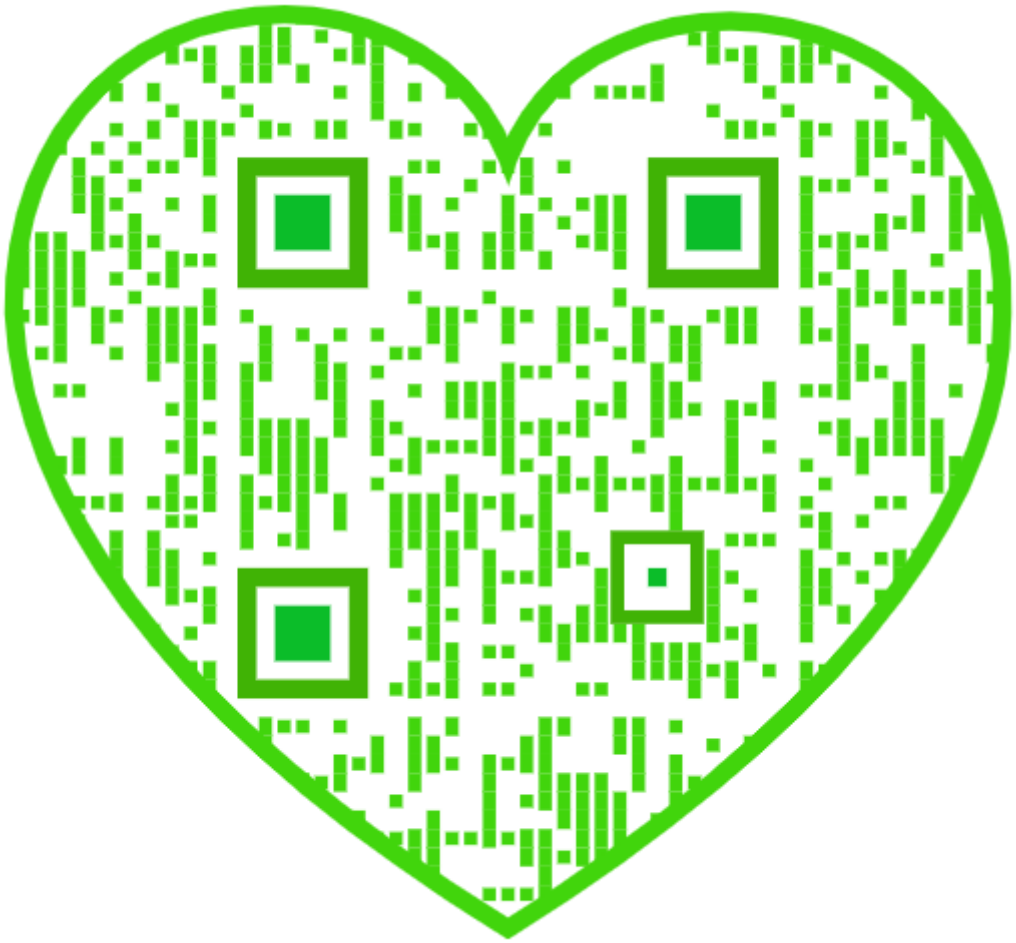
This machine, as ordinarily constructed, will dig a ditch too narrow for a man to work in, but the tiles may be laid by means of tongs or a hook, such as are frequently used. If it is desired to make a wider ditch, this may easily be done by inclining the axis of the wheel at an acute angle with the side of the platform. It is proposed to construct the machines adjustable in this respect.

The patent for this machine was granted, through the Scientific American Patent Agency, January 24th, 1860, and further information in relation to it may be obtained by addressing Messrs. Brayley & Pitts, at Buffalo, N. Y., to whom the invention has been assigned.

GUNPOWDER may be subjected to a heat which, whilst below that at which it explodes, is nevertheless greater than the melting point of sulphur. In this way all the sulphur may be sublimated, and the remaining charcoal and nitre rendered non-explosive. The object of the sulphur in gunpowder is to ignite the other constituents at a low heat.

THE company organized in London for building boats by machinery invented by Mr. Nathan Thompson, of New York, is stated, by the London papers, to have been very successful. A very large number of orders have been received for building boats of various sizes. In shape and strength they are said to be superior to boats built by hand, while the cost is much less.

© 1861 SCIENTIFIC AMERICAN, INC.



THE WAR.

THE BATTLE OF BULL RUN.

We have been waiting for the publication of the official reports from General McDowell and his subordinates in order to prepare our brief description of the battle of Bull Run; but as the day of making up our paper arrived without the appearance of any of the despatches except General Schenck's we came to the conclusion that we should be obliged to let it pass another week, and as by that time the interest in the battle would have measurably subsided, we should have postponed any further mention of it indefinitely. Just in the nick of time, however, there came to hand a full description by an intelligent eyewitness, George Wilkes, Esq., editor of *Wilkes' Spirit of the Times*, which we condense for the benefit of our readers, only regretting that we cannot publish it in full. Within a few years we have read with critical examination the great works of the most eminent historians—Grote, Arnold, Sismondi, Niebuhr, Thiers, Carlyle, Allison, Macaulay, Prescott, Irving, Motley and others, and, in our opinion, there is not to be found in them all so good a description of a battle as this by George Wilkes. It is comprehensive, lucid and graphic, with just enough of incident to make it full of life; written in a plain unpretending style, which occasionally rises with the subject into an easy eloquence, reminding one very much of Gibbon.

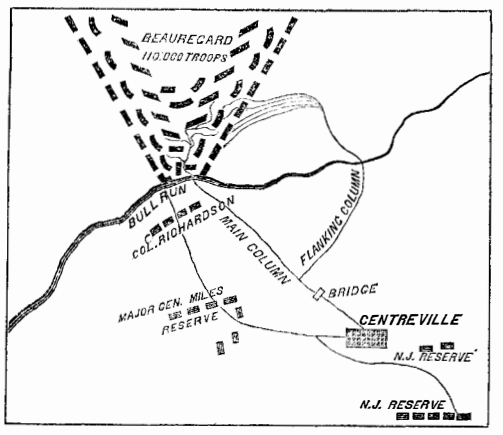
We extract and condense as follows:

GEN. MCDOWELL'S PLAN.

Meanwhile, and all the following day, the ablest engineers of Gen. McDowell's staff had been reconnoitering for miles around, and the fruit of their labors was a report that the enemy's position could not be turned to the left (or southward), by reason of the roughness of the roads; that it was not advisable to renew the attack of the 18th on the battery of Bull Run, but that the road to the right, through Centerville, was a practicable avenue to another crossing, and which was undefended, and to which artillery could easily be drawn. This was called the Warrenton road, and at some distance down, it had the further advantage of a path diverging from it to the northward, by which a circuit could be made to the rear of certain heavy batteries, which the course of the main road itself would enable us to strike in front. It was therefore decided by Gen. McDowell to send merely one brigade to Bull Run to hold that battery in check, and to make his grand attack by the Warrenton road, relying upon the column that was to pass off into the northward path to turn the enemy's position and throw it into confusion while assailed by us upon its face. This seemed to be a very proper and consistent plan. Undoubtedly the theory of it was a good plan (as a theory), and it might have been practically successful, had it but fitted the proportions of the enemy. Unfortunately, however, Gen. McDowell had not taken the full measure of his foe, and the circuit which he had decided upon, instead of reaching the base of the rebel's principal position, merely plunged against the side of his triangle, where he was most fearfully in strength, and where the most desperate valor could but serve to feed his guns. The Confederates, as he might have ascertained, numbered, without Johnston and his forces, at least 70,000 men; and he now proposed to fling against this compact mass, reposing in jungle behind batteries of the heaviest guns, some six or seven brigades, to explore the labyrinth of that terrible position, and seek, by impetus alone, to butt a hole through it, and hold on to the lower end.

POSITION OF THE ENEMY.

On their part, the rebels lay on that brilliant moonlight evening enfolded in vast strength; their position being that of a triangle, with the point toward us, and branching upward to Manassas, with an open base of several miles. The point or open of this triangle, about a mile round, was most heavily protected at Bull Run, where the direct road to Manassas crossed the Occoquan. All up its branching sides, however, batteries faced outward in deep rows, their ponderous iron tusks, concealed by artificial masks wherever natural groves did not volunteer a screen. A stronger field position could hardly be imagined. Defended as it was by 70,000 men to be increased to 110,000 in the morning, it would scarcely suffer in comparison of strength with Solferino or Sevastopol; and I doubt if there is any French or Russian engineer who would have undertaken to assail it except by regular approaches, and several respectful days of distant compliment with heavy shot and shell. Brigadier-General Irwin McDowell, however, was going at it with a few 32 pounders and 10 field batteries (nearly all of them light), backed by some five or six brigades, whom, mentally, he gave the credit of believing to be equal to its capture. Had our poor fellows but known the depth of the compliment thus lavished on their prowess, I doubt if they would have risen so joyful for the fray on the lovely Sunday morning now so near upon us. What rendered things even still more desperate, could we but have known their state, the enemy were thoroughly acquainted with our strength and our intentions, and awaited our coming with the greatest eagerness. Their anxiety, however, was deeply mixed with dread that our General might change his mind. With them, therefore, the eve of this battle was a night of true hopefulness and intelligent reliance, and well might the rebel chieftains, as they looked proudly over the vast host which an immense and desperate energy had got together, flatter themselves that they now had the fortunes of the Great Republic, which they had so long contemned and plundered, securely in their grasp. In this belief Davis and his legions early went to sleep, while our battalions, half rested, rose a little after midnight, to be wearied by several hours of hot march before entering upon the more violent fatigues of the attack.



The order for an early movement in the morning was promulgated in our camp at 10 o'clock on Saturday night.

As the time of our start was fixed at 6:30 P. M., the entire army was awake an hour before, and in marching order at the indicated moment. It was bright moonlight; yet through the brilliant sheen some of the stronger stars looked curiously down, as if they shared with us our wonder at the spectacle. From the hill at Centerville, backward toward Fairfax, the whole valley, so lately untrodden in its verdure, was sparkling with a frost of steel; and as the 30,000 bayonets moved forward in the uncertain light, with that billowy motion peculiar to the step of troops, the stirring mass looked like a bristling monster lifting himself by a slow, wavy motion up the laborious ascent. To the left, and forward through the village in the direction of the Run, the ground descended three or four miles toward the Occoquan, and then rose in a gradual ascent to Manassas. It was a scene of mingled grove and opening, and the moonlight slept as placidly upon the jungles of that rise as if Treason, armed in triple strength, were not slyly watching from its lair our ignorant advance, ready to belch forth upon us its deadly and malignant fires.

PLAN OF THE ATTACK.

The plan of Gen. McDowell was, as I have already indicated, to advance upon the enemy in two directions, launching his main and central column along the Warrentown road in a direct line, until he reached the batteries; while a strong column, by a circuit to the right, was to smite them in the rear. The road to Bull Run on the left, and the hostile batteries at its end, were to be merely watched throughout the day, so that the enemy could not issue from that quarter and turn our left, twenty regiments of reserve being posted at three positions in the rear. The central column numbered between 8,000 and 9,000 men, and that designed for the flank attack, between 13,000 and 14,000, making in all about 22,000.

The halts were numerous, in order that the generals might insure the compactness of the line, and presently we all passed across a wooden bridge in quiet, no challenge being made that might prevent us from reaching the deepest entanglement, where the foe desired to give us more bitter battle. Onward we went, the soldiers cursing the rough road, wondering when they would have breakfast, vowing to get even on the fellows who had put them to all this trouble. The day broke mildly as we pushed along, and many a soldier thought, from the dead silence of the woods that lined the road at intervals, we should have no battle after all. Presently we struck the path that branched off to the right, and here the column, under Hunter's lead, broke off, while the central column, with McDowell at its head, went directly on.

THE MAIN ATTACK.

As the circuit of the flanking column was to be a wide one, and as it could not reach its destined point and come into action with effect in less than two or three hours, our first attention must be given to our main column, accompanied by the Commander-in-Chief. It was broad day when we parted with the flanking column, and we proceeded along with an easy step, with our skirmishers well in advance, and watchful, on the lookout. No trace of the enemy appeared, however, and the extraordinary quiet of the scene, coupled with the fact that our entire column had been allowed to cross the wooden bridge unmolested, induced many to believe that the enemy, consulting prudence, would yield the defenses of the Run, and give us battle only at Manassas. But this idea was formed in perfect ignorance of the extent of the Confederate defenses, for we were already within range of some of their batteries, and at the close of the day they landed their shell upon the bridge with murderous effect. In short, their whole strategy was a decoy, and their hasty retirement from Fairfax, and pretended abandonment of camp furniture, as well as the shallow obstruction of our advance by leveled trees, were merely portions of a well-digested plan to coax our army, step by step, into their gigantic trap. Of all places, therefore, on the whole continent, Manassas and its miles of densely serried batteries was the last with which the Federal army had any business; yet there we were, "going it blind," with the vain confidence of fools, on perfectly good terms with ourselves, and exalting in advance our profound military leader, who was thus giving us a chance to develop his keen foresight and commanding genius.

After we had got about a mile and a half beyond the wooden bridge, the road began gradually to slope toward the Run, and to be more closed in with trees; and even at that early hour the coolness of those leafy aisles was felt as a relief from the already hot and dusty path. After we emerged from this pleasing shelter, the column proceeded along to the distance of, perhaps, a quarter of a mile, descending all the while toward a ravine which harbored a sluggish stream crossed by a stone bridge. From that point the enemy's defenses rose, spreading and thickening at easy intervals, and surmounted by powerful batteries where the line met the horizon; and I may pause here to say—with powerful batteries packed, and extending behind that line for miles along. Suddenly, an exclamation of "There they are!" from a member of Gen. Tyler's staff, brought our column to a stand. Every field officer at once brought his glass to bear, and the consciousness that we were surely to have a fight ran in an electric whisper along the entire column. There, indeed, they were, the Rebels, down in a meadow, still at a distance, and not boldly perceptible, because of the dark background of the woods. It was a body of infantry drawn up in line of battle, its full strength concealed from being extended partly in the forest. It was now necessary that we also should take battle order; so we deployed into the adjoining fields, Gen. Schenck's brigade, consisting of the 2d New York and 1st and 2d Ohio Regiments, being extended to the left, and Sherman's brigade, composed of the New York 69th, 79th, 13th, and 2d Wisconsin, stretching on the right. The large rifled 32-pounder was then brought forward through the center, and put into position in the middle of the road. The enemy evidently saw this movement with their glasses, for they suddenly fell back, whereupon the big gun, giving out its thunder, flung a shell toward the spot of their retirement.

© 1861 SCIENTIFIC AMERICAN, INC.

The fuse was short, however, and after plowing its roaring progress just over the proper spot, burst harmlessly in air. But the echo of that solemn challenge announced to a hundred and fifty thousand armed men that the battle had begun. The silence that followed was profound; but it was broken by no answer from the enemy; so, after a pause of several minutes, our iron monster spoke again, this time leveling itself at a battery higher on the hill, and dropping its compliment directly inside the works, to the destruction, as we were afterward informed, of half a dozen men. The enemy, nevertheless, did not seem to think the game quite made, and though he was near enough, as it was subsequently proved, to reach us from two or three positions on our right and left, persisted in a sullen silence. Our first shot had been fired at half-past six, and it was now after seven; still the foe deigned no response, and it was plain he would not be satisfied unless we sought him deeper in his fastnesses. The big gun, therefore, was superseded by light artillery for closer service, and an order was given for the brigades, thus strengthened, to move right and left and explore the adjoining woods. This order necessarily brought up the brigade of Keyes, which now occupied the center, but still acting as a reserve. The timber branched away on either side in a sort of crescent toward the batteries of the enemy; on the right hand, however, it pursued the straightest line. Both brigades, with skirmishers well out, at once proceeded upon their respective tasks, Schenck following a left oblique along the edge of the wood, with Col. McCook and the First Ohio in the lead; Col. Tompkins and the New York Second next, with the Third Ohio, under Col. Harris, in the rear. The brigade proceeded in this way, exhibiting the utmost caution, for the distance of about a mile, when they struck a fine newly-opened road to the left, whose clean, broad path seemed to invite their entrance. They turned into it and followed it for some distance, when, to their surprise, it ended abruptly at a fence, with no evidence of any road beyond. Suddenly the enemy showed himself in two or three places to the left, and shaking his flags at our troops, opened a a tremendous fire. It was promptly answered by the whole brigade, who endured the storm of balls with the greatest fortitude, and returned fire for fire. Several fell at this spot, and among others, the favorite drummer-boy of the Second. The poor little fellow was struck by a cannon ball, which took him just below the arm-pits and literally cut him in two, his childish shriek of pain mingling with the whistle of the rifled shot as his little life went with it down the wind. The storm from the batteries seemed now to increase rather than to slacken, and unable to endure it in such an exposed position, the brigade fell, in good order, back upon the wood.

The Sherman brigade, which had separated from the central column, and went off to the right at the same time that Schenck's brigade set out in the opposite direction, had proceeded but a little way upon their errand before they were saluted with a fearful shower of shot and shell; but receiving it only as a provocation, they overran two or three earthworks with their headlong charges, the Irishmen and Highlanders screaming with excitement all the while, and the stout Wisconsonians and brave New York 13th silently wading by their sides. But we must now leave them in the midst of this pleasant and congenial work to follow the fortunes of the flanking column.

THE BATTLE ON THE FLANK.

Having now shown the course and features of the battle on the center, for three hours, we now turn to the flanking column, which was expected to be able, in about that time, to turn the rear of the Confederate position, and unite itself, through the broken columns of the foe, with the direct onward tide.

Immediately after leaving the central column, the Burnside brigade having the lead, threw out its skirmishers, and proceeded along at a brisk rate, preserving, however, common time, in view of the long distance to be made. The course for the first four or five miles was rather boldly to the right. It then inclined more gently to the northward, and then, after some eight or nine miles had been accomplished, curved toward the left. The march was a most fatigueing one, and though shaded to considerable extent by long stretches of close timbers, much of it lay in the glare of the hot sun, and all of it had its share of stifling dust, except where we crossed the fields. But the men were hungry and very much fatigued, most of them having got but two or three hours' sleep the night before. Still they trudged cheerfully along, animated by the task before them, and made more elastic by the sound of the cannonade, which had for some time been heard, and which they were now sensibly approaching. In the brigade, nay, in the whole line, none heard this with higher spirits than the 71st. About 10 o'clock the head of the column came into an open country, and after proceeding in it for a mile, Capt. Ellis of the 71st, detected a masked battery about half a mile to the left; and bringing our glasses to bear upon it, we could also perceive the enemy moving to their position in considerable force. Soon after this, Gen. McDowell came riding up, and orders were given that we should proceed at a more rapid pace, and an hour more brought the brigade close to the rattle of the strife. The column now made its final curve, and turning sharply to the left faced the roar of battle as it came from the head of the central column, which, under the lead of the 69th, was now pressing its way toward us. The din of great guns and musketry at this point was almost defeaning, and the very earth trembled with the roar of the heavier artillery. Burnside, who was forward, then sent an order to the 71st to take its howitzers and dash through a piece of woods and form its position on the right of the Rhode Islanders. Obeying the order with alacrity, the 71st passed the New Hampshire men in their impetuosity and emerged into the fire, while the 2d New Hampshire formed in good order on the extreme right.

THE RHODE ISLANDERS, THE SECOND NEW HAMPSHIRE, AND THE NEW YORK SEVENTY-FIRST.

The Rhode Island cannon were the first in position, and opened with good effect upon the battery that was peppering us, with a heavy cross fire upon the left. The howitzers of the Seventy-first were next in play, and, between their heavy roar, the muskets of the brigade replied with interest to the similar salutations of the enemy. But the fire was most galling to us, from our exposed position, and among those of the brigade who fell before it was Gen. Hunter, sufficiently hurt to require his removal from the field. Burnside lost his horse at the same time; while the charger of Gov. Sprague had his entire head taken off with a shell as his gallant rider was spurring him up and down the field Captains Hart and Ellis, of companies A and G of the Seventy-first, were likewise wounded in this fire, while bravely cheering on their men.

An order was then made to advance our colors to the front, but, as it seemed to be certain death to stand exposed to the tornado which swept over the brow of the hill, the color-bearer naturally hesitated for a moment, whereupon several of Co. F sprang quickly forward with the exclamation, "Give us the colors." But Capt. Coles, of Co. C, was the foremost in the effort, and seizing the flag, he ran with it full fifty paces to the front, and held it at arm's length high in the air, and then planted it into the earth. Its folds were hailed in the rebel battery with a demoniac yell, and in the next instant the bright banner was riddled with a shower of balls. Providentially, the gallant captain was untouched.

Beholding that starry challenge, the Alabama First, which had long ago expressed in print their desire to meet the New York Seventy-first, deployed from a wood upon the right, and formed in full force to charge up hill upon the flag. The Seventy-first, recognizing them, answered the challenge with a shout, and springing forward, delivered a volley of musketry, strengthened with a dose of grape and canister. They then charged down the hill upon them with tremendous vigor, intending to take them with the bayonet. But the Alabamians did not like the war whoop nor its prologue, so, after a volley and a short pause, they took back to cover, leaving 62 of their dead upon the field. We had a chance to count them, for we never afterward lost the brow of that hill till the general conclusion. The howitzers of the Seventy-first and Rhode Island battery all the while kept in play, and in ten minutes more the rebel battery was silenced.

The enemy's lair being thus swept of its cannon and forces in this quarter, and the army being pretty well exhausted with the strife and heat, Burnside came forward and ordered the Seventy-first to fall back into the cool shadow of the wood, with the remark that the brigade had done its full portion of the day's work, and was now entitled to refreshment and repose. The Seventy-first most gladly obeyed the order, and left the field with as much regularity as if on dress parade.

While the Seventy-first thus refreshed itself, the Sixty-ninth, which, with the Scotch regiment, the Wisconsin men and the New York Thirteenth, had been wading through batteries since their arrival on the field, marched past in splendid order, their banners flying as if upon review, and their faces sternly set on the advance. They passed down the hill obliquely to the right, on their road to support Griffin's battery, which was within 200 yards of the artillery of the foe. Though silent as they passed, a shout rose in a few seconds afterward from the direction they had taken, which every listener could mark for theirs; and the spiteful one which responded from the rebel battery was soon quelled by the volume of their musketry. Most prominent among them was Meagher, the Irish orator, who frequently, during the contests of that turbulent day, waved the green banner of his regiment up and down the hottest line of fire.

The Sherman brigade had thus worked its way deep into the enemy's position, no part of it doing better service than the Second Wisconsin and the staunch Thirteenth. Wherever they, or any of them, had met the foe on foot, they had hurled him back, and driven him headlong to his cover with disgrace. Indeed, this superior prowess of the Northern rank and file was the feature of the day, and in no portion of the field, and under no circumstance, could their exposed and unsupported infantry stand for five minutes against the dash and hardihood of ours.

I must now turn back to the general progress of the flanking column, from which the Burnside brigade had been the first to curve into the attack. Porter's brigade, which came immediately in its rear upon the march, passed further on, and leveled itself against the triangle of the enemy at a higher point, going into the battle about 11 o'clock. They, too, charged one battery after another, working their way into the enemy's position.

CHARGE OF THE ZOUAVES.

At the extreme right was the Fire Brigade. As they made the widest flank circuit, they came latest into battle, arriving on the field about 12 o'clock. They were hurled against a nest of batteries, and though their charge was terrific, they were unable to carry the enemy's position before them. They fell back in the vicinity of the Seventy-first, and while resting here were passed by the Scotch and Irish regiments, the columns of the flank and center thus meeting on the battle field.

Nearly the whole of our army was now grouped pretty well together. The brigades which had made the circuit against the enemy's side had been joined by those which had fought straight on; and a glance at the field showed that the whole breadth of our battle had not spread over a mile and a half. Had we been up in Professor Lowe's balloon, we might have seen at once that, with all our prowess and heroic daring, we had merely cut a hole in the small end of the enemy's plateau of batteries, and that his rear, which our General imagined he had turned, overhung us in massive wings, which still remained untouched. Our plan, therefore, was, as I said before, too small for the measure of our customer. The coat which had been chalked in conception of a boy, would not inclose the proportions of a man, and we were destined, as is often the case with new beginners, to have our work turned upon our hands. This truth came soon; for suddenly, as we were resting, the roar of battle broke out again in every direction, and batteries we had thought mute forever, now opened with redoubled fury. The most terrific yells from the enemy accompanied the renewal of the conflict, and it became evident that, instead of having yielded to the untoward fortunes of the day, they had only been refreshing themselves while pouring new regiments into their lower works. The Sherman Brigade, astounded by this new assault, was forced to retire from the position it had occupied; but it retreated in good style, and being now entirely without orders, began to march off toward the rear.

The battle continued fiercely about two hours longer when the firing nearly ceased, and everything indica-

© 1861 SCIENTIFIC AMERICAN, INC.

ted another lull. But suddenly a cry broke from the ranks of "Look there! look there!" and, turning their eyes toward Manassas, the whole of our drooping regiments, as well those who were moving to the rear as those who stood, saw a sight which none who gazed upon it will ever forget.

THE PAGEANT OF THE ENEMY'S RESERVES.

At a long way up the rise, and issuing from the enemy's extreme left, appeared, slowly debouching into sight, a dense column of infantry, marching with slow and solid step, and looking, at this noiseless distance, like a mirage of ourselves, or the illusion of a panorama. Rod by rod the massive column lengthened, not breaking off at the completion of a regiment, as we had hoped, but still pouring on, and on, and on, till one regiment had lengthened into ten. Even then the stern tide did not pause; for one of its arms turned downward along the far side of the triangle, and, the source of the flood thus relieved, poured forth again, and commenced lining the other in like manner. Still the solemn picture swelled its volume, till the ten regiments had doubled into twenty, and had taken the formation of three sides of a hollow square. Our awe-struck legions, though beginning to feel the approaches of despair, could not take their eyes from that majestic pageant, and, though experiencing a new necessity, were frozen to the sight.

The martial tide flowed on, the lengthening regiments growing into 30,000 men, with a mass of black cavalry in its center, the whole moving toward us, as the sun danced upon its pomp of bayonets, with the solemn step of fate. This was war—compact, well-made and reasoning war. It was war, too, in all its pomp and glory, as well as in its strength, and we at once comprehended we were beaten. In vain did our startled faculties dart alertly hither and thither for some hope; in vain did our thoughts turn quickly upon Patterson. It would not do. Johnston was there before us, with his cool, fresh thousands, and our Waterloo was lost. That steady and untired host outnumbered the whole of our worn and staggering columns, and it penetrated us with a conviction of resistless power. Decently, however, did we gather up our force, not by general order, but by one sensible accord, and sad, and pained, and wearied, yet conscious of victory as far as we had fought, we folded up our columns for retreat. The only ones whose hardihood clung spitefully to the strife were a few regulars at the batteries, who, with the infatuation of experts, and begrimed with the mire of battle from all ordinary recognition, kept peppering at such batteries as would still provoke their fire.

Among the last to turn their faces from the fight they had so gaily sought were the Burnside brigade, which, accompanied by Sprague and its gallant brigadier, and headed by all its colonels, retired in line of battle, with orders to cover the retreat. Thus honored for its steadiness, the Rhode Islanders took off their battery, and the Seventy-first departed with its guns. All, thus far, had gone well with the departing movement, and our battalions from every portion of the field were retiring with decorum, when of a sudden some of the persistent regulars who were charged with the protection of the retreat, getting out of ammunition, sent back their caissons for a fresh supply.

I have described how that branch of the service made its charges in the morning, and how recklessly it always sought its way to the front, through the formed columns of the volunteers. In the same manner did it now go back upon its errand, riding down everthing in its road, and scattering the ranks of the regiment in every direction. The volunteers, who had never before seen such a sight, and who were already penetrated with the fearful pageant of the descending enemy, could only understand the movement in one way. Those flying carriages and those madly excited men were rushing to the rear and their action was therefore construed into a wild retreat. The thought which appealed to their agitated minds was, that if the regulars were in such a haste to escape, it was necessary that they should hurry for themselves, and one fearful panic took possession of them all.

The ranks of most of the regiments were broken, the streams of flying men commingled; even officers who had behaved with courage throughout the day, felt justified, by the precipitation of the regulars, to urge their men, with a sympathizing sense of pity, to hurry for their lives. Thus, mistake piled upon mistake, aggravated the misfortune, and culminated in a calamity which will rankle in the pride of the Republic throughout all her history. It seems marvelous that men who had borne the brunt of battle so bravely during the entire fight, and who left the field against a courageous foe with more than equal honors, could have so soon sunk into such puerile bewilderment; but so it was, and they fled headlong from an enemy more deeply hurt than they, and who hardly dared pursue. The panic soon communicated itself to the teamsters of the Federal army, who had improperly pressed too near, and scampering civilians spread the terror with an electric speed fast back to our reserves.

The enemy, perceiving this unexpected phase of our condition, at once sent out his cavalry to harass our flight, and many a fugitive fell before their charges. They rode furiously at our retiring columns, and when defeated of their object by the sublime devotion of our regulars and their cannon, they compensated their bloody rage by riding down and sabering the wounded. Carrying their atrocity to the extreme, they even assailed a hospital and shot the dying within it, and the physicians who were ministering to their wounds. One of these retreats they even burned, and all the helpless sufferers within it were consumed. I must pause here in the name of civilization, breeding and Christianity, to protest my disbelief that these infernal crimes could have been inspired or warranted by the leaders of their cause; but that they were perpetrated, and in repeated instances, is beyond dispute.

Through all the terror and confusion, however, there were several regiments which maintained their self-possession, and among these were the Burnside Brigade, the Rhode Islanders and the 71st, bearing their cannon to the bridge, and the entire brigade maintaining a firm line of battle to that point. But there new and unmanagable terror arose, and the bridge being blocked by overturned caissons and ambulances, these precious trinkets of the battalion were all necessarily left behind, from the utter impossibility of dragging them through the stream. Moreover, the enemy, who had failed to interrupt us at this point in the morning, for fear of discouraging the big Federal fly from entering his web, was now hitting the bridge most accurately with his shell. Bravery then gave up its heart. *Souve qui peut* became the word of all, and every man took to the creek or tried to fly the bridge for himself.

Thus was the stream crossed by frantic thousands, who then sought the cover of the woods, while others clogged with water and indifferent from sheer desperation, trudged moodily along the open path, as heedless of the explosions, which were spluttering about their heads, as if they were so many harmless Chinese crackers. A few brave spirits would now and then try to inspire the mass with heart, but the despair was too deep to be disciplined by words, and all such trials vain. The terrible phantasmagoria of Johnston's three-sided square, and those fire-belching jungles now picketed by our dead, were constantly present to their mind, and all felt that it would be through God's mercy only, in holding the sight of the enemy, that any of us would get off alive.

THE RESERVE.

The regiments left in reserve, though they found it impossible to stem the tide of fugitives which poured past them, preserved their own ranks in perfect order, and guarded the rear from some charges of cavalry that were attempted. Several of the brigades, too, that belonged to the attacking columns marched back in as good order as if upon parade.

There is but one thing I desire to add, and that is, had our columns but marched back to Centerville from the batteries they had so stubbornly engaged, in "common time," the day's work would have been called a Federal victory, and the assault by our meager divisions, a "reconnoissance in force."

It was a most providential matter that we had no more troops than was barely sufficient for such a "reconnoissance" against such a position and such numbers, for had we gone upon the ground with 50,000 soldiers more, we would merely have penetrated a little deeper into the Confederate trap, and the result would have been the same.

INCIDENTS OF THE BATTLE.

The paymaster of the Sixteenth regiment, finding that his regiment was one of the reserve, and would not probably come into the action, volunteered to go into the fight, and to assist one of his brothers, who was in the Seventy-first. He rode with lightning speed on a fine steed he took from Staten Island to the scene of battle. After having done good service for several hours, he was approached by two of the enemy's cavalry, one with the saber raised to hew him down, and the other with a pistol elevated for his destruction. Quick as thought, when the first came within 12 feet of him, he fired his revolver with fatal effect to his opponent; the other presented the pistol to his head, and he, in return, his pistol to his breast. They both fired together; the ball of the enemy passed through his cap, and his own ball through the heart, killing both of his opponents on the spot. He immediately secured the two horses, on one of which he placed a wounded soldier of the Seventy-first, then lying helpless near by, and told him to ride to Washington, which he did in safety. The other horse he secured, and has now with him in Washington as a trophy. The name of this intrepid and dashing officer is Henry D. Townsend, Esq., one of the members of the New York bar.

A member of the Seventy-first New York regiment states that in one of the charges of that regiment upon a rebel battery, he met at the point of the bayonet a member of one of the Virginia regiments, with whom he had formed intimate relations of friendship while the rebel soldier was at college in New York. Each instantly recognized the other, and instead of carrying out the work of death, they clasped hands with the exclamation, "God bless you," and they separated.

DISPOSITION OF THE FORCES.

The following was the position of the regiments in the battle:—

Central Column.—General Tyler's division—three brigades. First brigade, General Schenck, 2d N. Y. 1st and 2d Ohio; second brigade, General Sherman, 69th, 79th, 13th N. Y., 2d Wis., and Ayres' battery; third brigade, General Keyes, 1st, 2d and 3d Conn., and 2d Maine, with Tompkins's U. S. cavalry, and the N. Y. battery of Varian.

Flanking Column.—Hunter's and Heintzleman's divisions. Hunter's division, Porter's brigade, 8th, 14th, 27th N. Y., U. S. infantry, with Ransom's U. S. and Griffin's West Point batteries. Burnside's brigade, 1st and 2d R. I., 71st N. Y., and 2d N. H., with Reynolds's and Webb's batteries, and a battery of rifled 32-pounders. Heintzleman's division—First brigade, 5th Mass., 1st Minn., 4th Penn., with two batteries; second brigade, Wilcox, 1st Mich., 38th N. Y. and Fire Zouaves, and battery of U. S. artillery; third brigade, 3d, 4th and 5th Maine, and 2d Vt.

Watching the left.—Colonel Richardson's brigade, 1st Mass., 2d and 3d Mich., and 12th N. Y. volunteers, and a U. S. battery.

Reserve.—General Miles, 16th, 17th, 18th, 29th, 31st and 32d N. Y., 27th Penn., Garibaldi Guard and 8th N. Y. German rifles.

Reserve at Centerville.—The seven New Jersey regiments.

MURDERING THE WOUNDED.

Many stories are told of the secessionists firing purposely on our wounded as they were being borne from the field, burning hospitals, and stabbing wounded soldiers while pleading for mercy. We shall publish but one of these reports, and select the following on account of the respectable character of the surgeon who makes the statement:—

Surgeon Barnes went up to the battle field in the rear of the attacking column, and as soon as our men began to fall he took up a position with his assistants under a tree, in a little ravine. The wounded men were brought to him, and he took his green sash and hung it on a tree, to signify that the place was under the charge of a surgeon. The injured men were brought in rapidly, and in fifteen minutes he had under his charge nearly 30. As fast as possible he attended to their hurts, and in a short time had been compelled to perform a number of capital operations. He amputated four legs, three arms, a hand and a foot, and attended to a number of minor injuries. By this time the enemy had discovered the place, and the nature of the business of the men in charge, and began to pour in musket balls and projectiles from rifled cannon. The place became unsafe for the wounded men, and it was seen to be necessary to remove them. The surgeon's assistant and servant had become separated from him, and he had no one to send for ambulances, and was obliged to leave the wounded men and go himself.

It was no easy matter to procure ambulances enough, and it was probably thirty minutes before the surgeon re-

© 1861 SCIENTIFIC AMERICAN, INC.

turned with the necessary assistance. When he returned, he found that every one of those wounded men had been *bayoneted or sabered, and was dead.* They were literally cut to pieces.

THE LONDON "TIMES" CORRESPONDENT AT THE BATTLE.

We take the following from the Boston *Traveler:*—

Captain Dolliver, of this city, who was near the contending hosts from an early hour on the morning of the late battle until its close, says that a person unacquainted with military movements could only make out vast columns of smoke, and hear incessant peals of heavy artillery and the whistling of bullets. During several hours of the fight, he was in company with Dr. Russell, who was mounted on a fine horse, and who explained to him some of the movements as they progressed.

Russell rode up to the flanks of the various divisions engaged, and saw the distance they were apart, and the effect of the firing, which was decidedly in favor of the Union troops. Dr. Russell seems to have anticipated some disaster in the rear, from a casual remark to the effect that the battle was won, "if no mishap overtakes the rear of the Federal forces." As he explained to Capt. Dolliver some of the movements, he lent him his glass to see for himself. He said that our troops held their position like veterans, when opposed by superiors numbers, but they lacked steadiness in falling back.

Dr. Russel saw the rebel cavalry as they emerged from the woods, and remarked to Capt. Dolliver that they numbered about a thousand, and Capt. Dolliver himself says that he thinks that Dr. Russell was about right in his estimate. A very small force of even infantry posted could have driven them off the field, but that force was not at hand. They charged among the teamsters, and created a panic, which was more destructive than their swords.

Capt. Dolliver remarked to Dr. Russull that he thought the troops from the front, as they came up, would stop the retreat at a certain point; but the doctor said, "No; they are all more or less infected. It is painful—very painful; so we must look out, and make good our own retreat."

Capt. Dolliver and Dr. Russell retreated in company, until all danger from the victorious army was past.

GENERAL PATTERSON'S MOVEMENTS.

We find the following clear summary of General Patterson's operations in the Philadelphia *North American and United States Gazette*:—

The attack by McDowell was to have been made on Tuesday, the 16th of July, and on that day Gen. Patterson was to have attacked Johnston at Winchester, if sufficiently strong, or to hold him there by demonstrations of an attack. On the appointed day, Patterson found the army entrenched at Winchester, with from 35,000 to 42,000 men, and a very large force of artillery, his own army consisting of 18,000 and 18 pieces of artillery, of which 14 were 6-pounders, with a line of communication of 32 miles in his rear to be guarded. An attack, under these circumstances, being out of the question, he succeeded in keeping Johnston with this force at Winchester for three days, and then, by a flank movement, occupied Charlestown, a much better base of operations.

From this point, Gen. Patterson designed to advance, and had given orders for two days' cooked provisions, but was overruled by the unanimous opinion of all the regular officers with him. In addition to other reasons, it was stated that the term of service of our forces were expiring, and that they would no longer remain. Not believing this, the General addressed each regiment, making the most earnest appeals to them to remain one week longer. Four agreed to stay, the remainder refused. Of these, the most of them were without shoes, and unable to make any forward movement. The force began to melt away, and Gen. Patterson moved to Harper's Ferry, where reinforcements could replace the returning troops. The result of the foolish enlistment for three months is now apparent—we are perfectly helpless when most needed. Our Pennsylvania troops have been in a state of discontent ever since they have been in the service, which has been much increased since they have discovered the inefficiency of their officers. It was therefore absurd to suppose they would extend their term of enlistment for a day.

At one time, Gen. Patterson had a fine force with him, and instantly advanced into Virginia. This was on the 16th of June. But he was peremptorily ordered back by Gen. Scott, and his artillery and best troops detached. No criticism is here intended in regard to the plan of the campaign, but this order from headquarters has always been ignored by those disposed to find fault with Gen. Patterson. Finally, when allowed to cross the Potomac, and to get a crack at the enemy, *if it could be done without risk*, he advanced with 9,000 men against 15,000, and forced Johnston back to Winchester. The public certainly cannot be aware that General Patterson entered Martinsburg with 9,000 men, while the newspapers were giving him 25,000 and 30,000.

It ought to be remembered that Johnston and Beauregard were connected by a railroad, and could throw their troops either to Winchester or Manassas, as should be deemed best, while our three columns could be of little avail to each other. If Gen. Patterson had made an attack on the 16th, while McDowell was not yet threatening Manassas, he would probably have fallen into a far worse defeat even than the one we have now experienced.

The contemptible insinuations which have here and there appeared in the newspapers, in regard to Gen. Patterson's personal courage, are beneath contempt. With the real soldiers that are about him (not the paper warriors), his fault as a general is rather esteemed to be a too great anxiety to settle the campaign by a battle and a needless exposure of his own person.

RELEASE OF THE SUMTER'S PRIZES.

By the last arrival from Havana, we learn that the Governor-General of Cuba has, as it was his duty under the Spanish-American treaties to do, set free the six American merchant ships which the Confedrate privateers imprudently carried into Cienfuegos. Further, also, the *Sumter* has been ordered to leave the port which she has thus illegally entered with her prey.

Correspondence

Letter from an Inventor in the Army.

CAMP LYON, NEAR ST. JOSEPH'S, MO., July 21, 1861.

MESSRS. EDITORS:—Since my last somewhat funny communication, suggesting the idea of forming a regiment of inventors, and announcing myself ready to serve in any capacity, from captain down to a drummer, in such a regiment, I have laid down all my mechanical pursuits, and seriously taken up the sword. I have entered in the ——— regiment of the Missouri Reserve Guard. * * * * * * * * * Our company is composed mostly of Germans, and the captain—a man of much experience in the drug and liquor business, but of very little experience in military matters—is himself a German.

The captain, on learning that I have served eight years in the Austrian empire, most of the time as orderly sergeant, and a long period as a private secretary to Marshal Radetzky, has promoted me to the position of corporal, and I am to-day in that capacity on guard, and must be in a hurry in writing this letter so as to relieve the sentinels which are placed around our camp.

You are aware that the rebels in Missouri are destroying by wholesale the few railroads we have. To stop this, our company, in connection with some Iowa regiments, are constantly guarding and patrolling the St. Joseph and Hannibal Railroad. A few days ago, as the rebels intended to burn all the bridges and engine houses on this road, we were ordered to guard the engine house at Brookfield, about midway between Hannibal and St. Joseph. Here I have learned the bad character of the secessionists, and determined to treat them as miserable traitors. After our sentinels had been posted, and the company allowed to rest, I lay down in the engine house in a place where I could see and examine all the magnificent locomotives, ten in number. Upon the sight of this work of American skill and ingenuity, my thoughts were filled with grief, for, had we not arrived in due time, all these beautiful engines would have been destroyed. A few years ago I was sitting in one of the Sultan's mosques in Constantinople, the interior of which is finely decorated, and worth seeing; but such an American locomotive engine house, with its engines, considered with their utility, certainly presents a more magnificent sight than the Mohammedan mosque.

The rebels did not undertake to come close to the engine house, but dispersed, leaving a few horses behind them, and our company has again returned to camp.

I like "sojering" very well; so does the rest of the company. The government provides for the soldiers an abundance of everything; but our officers, not one of whom knows how to manage a company of 100 men, or how to distribute the rations properly, make a great deal of trouble in the company. This, connected with the brutality which they show toward their subordinates, makes the company dissatisfied. I wonder if the government or the highest military authority of the United States could not remedy this? * *,

Corporal Co. ———.

Malarious Camps.

MESSRS. EDITORS:—I notice your advice to soldiers in regard to malarious diseases, and would ask if the experience of our Western settlers does not furnish a hint for the locality of soldiers' tents? I have known families enjoy tolerable health on the bank of a creek, and afterward build their houses half way up the hill in a snug little nook, and then seldom be free from sickness. Houses thus sheltered are often observed to be sickly while others in the immediate neighborborhood, at the top or at the base of the hill, are healthy. And it is said the western bank of a stream is more unhealthy in some regions than the eastern; and on bottom lands, the rear of a large clearing, just by a tall forest is more unhealthy than the front on the bank of a river. Men may wish to avoid the cold blasts of winter or the scorching rays of summer, but it seems any locality which does not allow free access of the winds is not desirable. Our medical men, doubtless, have knowledge on this subject. Ought not our commanding officers to be influenced by this knowledge in selecting camp grounds? Why are the troops at Cairo more healthy than those a few miles further back in the country? N. B.

Shelbyville, Ky., July 19, 1861.

Malaria.

MESSRS. EDITORS:—In a recent number of the SCIENTIFIC AMERICAN, under the head of "Advice to our Soldiers," there is an article on the subject of "Malaria and its Remedies."

It is true that there are many things connected with this subject which are mysterious, but there are some facts established by observation which may be of great practical utility to soldiers in a malarious district of country.

For instance, it is well known that persons residing immediately upon the edge of a stream from which miasma or malarious effluvia is emitted, frequently suffer less from it than those who reside upon adjacent high grounds; and this is more especially the case where residences near the water are protected by some intervening screen, such as rows of trees, or a piece of higher ground near the banks. The reason is, that the malarious matter floats in the air, and passes over the heads of those located in the low grounds, and thus reaches the edge of neighboring heights, especially on that side of the stream most exposed to the currents of air occasioned by the prevailing winds.

There is another fact which should be kept in mind. The miasma, whatever it is, is generated in large quantities in low, marshy grounds, where the water is shallow, but when this water communicates with creeks or rivers, it is carried along with the currents of such streams, and is eliminated in the greatest quantities where their water is agitated, or broken up by falls or rapids.

Twenty years ago or more, the writer of this article had ample opportunities of observing these results of malarious effluvia along the course of the river Susquehanna, which is a wide, shallow stream, interrupted by many rapids. Persons residing upon its banks, in places where it passed along in a deep, smooth current, generally enjoyed good health, while those near its falls, or rapids, were as generally attacked by fevers. Of the lock-keepers upon the canal scarcely any escape.

This is readily accounted for on the supposition that the agitation of the water occasioned the escape of the deleterious gases, or other substances, which were carried harmlessly along where the current was smooth. S.

New Albany, Indiana, July 21, 1861.

[We are induced to publish the above two communications from our respect for the writers. We have observed, however, that eminent professors of medical science, when they have adopted any belief, either true or false, are quite as apt as other people to be constantly finding new incidents which, to their minds, are cumulative proofs of its truth.

We know that the opinion that the immediate bank of a stream is generally less unhealthy than locations at a little distance in the rear, is very common, and it seems to have arisen from independent observation in so many places that we are inclined to attach to it some degree of weight. It is certainly not universally true. Illinoistown, opposite St. Louis, is widely renowned for its unhealthiness, and it stands immediately on the eastern bank of the Mississippi. We suppose that both of our correspondents would wish it distinctly understood that it is best to keep out of low valleys entirely whenever it is possible.—EDS.

RAILROAD BELL TELEGRAPH.—A patent has lately been taken out in England by G. Sandys, for conveying signals by bells at the different railroad stations, which appears to embrace some very useful and novel features. The inventor communicates between two distant points any pre-arranged code of bell signals, independently of a specific communication indicated upon a dial, by a hand which is deflected, and remains at rest until it is released by a return signal. Two electro-magnets are used, in combination with their poles, arranged in such a manner, that one actuates the bell signal, and the other the pointer of a dial. When it is desired, any number of signals or strokes may be given to the bell, without affecting the usual signal of the dial.

© 1861 SCIENTIFIC AMERICAN, INC.

Workingmen's Cottages in France.

Near Mulhouse, one of the chief manufacturing towns of France, a philanthropic society, assisted by the State, has built a village for workingmen, who purchase their separate dwellings, paying by installments, and subject to certain regulations. This village is built on a plain, traversed by a canal, between Mulhouse and Domach, and conveniently near the factories. The streets are quite straight, and the principal ones open into a square, La Place Napoleon, in the middle of which one large building contains baths and washhouses, another the *restaurateur*, the bakery, the library and the shop. There is an infant school for accommodating 150 children on the other bank of the canal. A house is also provided for the medical men, the deaconess, or Protestant Sister of Charity. There are two sorts of houses in the *Cité Ouvrière* of Mulhouse—one detached in the midst of a garden, the others forming a continuous street; houses in one of the continuous streets are furnished, and let out to unmarried men. In 1860, there were 139 detached houses, and 39 more were being built.

Each block is divided by partition walls into four separate dwellings, which are let out or sold separately, and contain nearly the same accommodation; that is to say, two rooms on the ground floor, one being the living room and kitchen, and the other the principal bedroom; the second floor contains three bedrooms; the attic is large enough for a bed, at a pinch. There is a vaulted cellar under the ground floor, for storing wood and wine. The details are convenient, and the architecture elegant. Each group of four houses covers about 170 square yards. The gardens are well-cultivated, and the houses neatly furnished and kept.

These sets of apartments are sold at cost price to the workpeople, viz.: from $465 to $580 each. On a $580 house, the society expects $60 to $80 down, and a rent of about $5 a month for fourteen years, when the tenant becomes the freeholder. The purchaser, or contractor to purchase, is bound to keep up the exterior as he receives it—to cultivate the garden, to take care of the trees in the street, and not to sell, or sublet, without the permission of the society, within the first ten years.

This experiment was commenced in 1854; it made way very slowly at first. At present, all the houses are occupied, and there are applicants for all those in progress. As to sales, in November, 1860, out of 560 houses built, there were 403 sold. The example of Mulhouse has not yet been followed in the other manufacturing towns of France. Mulhouse has the advantage of long-established families—of wealthy manufacturers. This building association was commenced with a capital of $60,000, in 60 shares of $1,000 each, subscribed by 12 persons, who agreed to confine their profits to 4 per cent. The government gave them $60,000, on condition that they spent $180,000, sold the houses at cost price, and let them at 8 per cent. The capital was afterward increased, and money was borrowed on mortgage of the houses at 4½ per cent, which is being paid off by a sinking fund derived from the installments of purchasers. At present, their capital amounts to $320,000, beside the $60,000 given by the State, which has been expended on public improvements, baths, planting trees, gaslighting, &c. It may be noted that this successful freehold cottage society is in Alsace, and that these frugal, neat, industrious workpeople are Germans and Protestants.

Suspension of Work on the Hoosac Tunnel.

Our readers are aware that the route of the Troy and Greenfield Railroad, extending from Troy, on the Hudson river, in this State, to Greenfield, on the Connecticut, in Massachusetts, is laid out to pass through Hoosac Mountain, in the northwest part of Massachusetts, by a tunnel. We have published the dimensions of the tunnel, and have, from time to time, mentioned the progress of the work. It is now suspended, and the Chief Engineer, Herman Haupt, Esq., has issued a circular giving the reasons for the suspension. The principal one was a change of policy on the part of the State Engineer, a change having been made in the office by the appointment of Wm. L. Whitwell, Esq.

Mr. Haupt, in the course of his explanation, speaks of having "commenced to build the long-talked-of pneumatic drills and ventilating apparatus. The drills, in shop experiments, which are unfavorable tests, more than answer expectations. Within the last week, they have been so nearly perfected as to penetrate the hardest granite 12 inches in 12 minutes, and 21 inches without sharpening, which is more than we have ever claimed for them." We suppose from the name, that these drills must be worked by compressed air, which, on its escape, ventilates the tunnel, the plan adopted in the great tunnel through the Alps in Switzerland, the work on which has also been suspended.

The New Army Ambulances.

Of the many styles of conveyances for the convenience of the sick and wounded soldiers, we think there is none that excel the light and almost perfect arrangement recently introduced, and now promising to supersede the old four-wheeled ambulances. The body is fifty inches wide, and is divided into two compartments, each one entered by means of a door at the rear. The driver sits outside, entirely away from the sufferer, and is protected from inclement weather by an adjustable calash top. The ambulance has four steel springs resting on the flexible hickory shafts, and the bed on which the patient lies is also supported by four other steel springs, to which are attached small wheels, to facilitate the movement in and out of a wounded soldier without his rising.

The bed and mattress is a decidedly ingenious arrangement, and should be seen to be fully understood. Either can be raised at any elevation desirable, and either end of the mattress can be made into a good pillow in an instant. A small trap-door in the center of the bed, worked by means of a spring and bolt, affords a convenience to the sufferer that can easily be appreciated. If the weather is warm and the sun too hot to admit of hoisting the curtains, a turn of a button unloosens a section of the side, which drops down upon its hinges, and the cool air can pass through (and over the inmate), while the curtains still shut out the rays of the sun. Several also have a rack over the bed, where a trunk or any clothing desirable can be placed, and everything that would conduce to the comfort of the wounded be immediately within his reach. In fact the new ambulance is a complete movable hospital, in which the sufferer can rest at ease, forgetful that he is in the camp or upon the deserted battle field.

THE STEEL PEN DISEASE.—Last February President Felton, of Harvard University, called public attention to certain pains and debilitating affections often experienced by persons accustomed to write much with steel pens, sometimes amounting to a complete paralysis, and rendering an amanuensis necessary. The theory was, or is, that the ink and the steel together form a sort of galvanic current injurious to the nerves of the hand and of the arm. There is no theory that will not find some confirmatory facts, and President Felton has received numerous letters proving the efficacy of the old goose quill as a remedy. As the steel pen is geneally used in a handle composed of a non-conducting substance, the paralysis of the arm arising from the use of steel pens cannot be due to an electric current flowing from the pen; therefore the electrical theory will not stand the test of science.

On this subject the Philadelphia *Ledger* remarks:—

We are inclined to think that this complaint is much more common and much older than steel pens. Mark the fatigued look and increasing illegibility of the writing of all rapid thinking authors, like Byron and Coleridge. They all write as if pins were sticking in their wrists. And yet there are bank clerks, who for years will go on calmly making entries, with steel pens, from day book and ledger, and never feel it.

The real cause of the disease is writing too rapidly, and with care only for the thought, and not for the mechanical shape of the letters. It is because the nerves of volition move more rapidly than the muscles can follow, as thought outstrips expression.

There is much force in these remarks, and yet they will not account for the removal of paralysis in persons who have ceased the use of steel and returned to the old goose quill. Cranky writing like that of Byron does not indicate disease of the hand. By using a very smooth pointed pen, and a light holder, the nerves of the arm will not be readily affected.

THE stock of cotton bales, last week, in New York was 25,000. The sales were 6,000 bales; only 165 bales are reported to have been shipped to Liverpool during the week.

RECENT AMERICAN INVENTIONS.

Manufacture of Iron.—This invention consists in the manufacture of wrought or malleable iron from pig or cast iron or direct from the ore, by subjecting the metal or ore, while in a melted or boiling state, to the simultaneous action of a current or currents of electricity and of nitrogenous salts or other nitrogenous substances or of nitrogenized hydrogen. The inventor is Mr. Anthony L. Fleury, of New York City.

Military Cap.—Mr. J. F. Whipple, of New York City, is the patentee of an invention in military caps It consists in a cap having its crown and a cape for the protection of the back of the head and neck made of a seamless piece of felt or other soft material, and having a peak of leather or other moderately stiff material, to the sides of which the cape is united and by which the cape is kept in proper shape. The Seamless Clothing Manufacturing Company of New York city, are the assignees of the invention.

Fireproof Buildings.

"The late gigantic fire," says the London *Review*, "has tested and found wanting our present system of fireproofing warehouses. Party-walls of immense thickness, stone stair-cases, iron beams, and pillars have been of no avail against the spontaneous combustion of a little heap of hemp; and the probability, indeed, is that one of the most valuable lives in our working hive has been sacrificed to our latest notions of fireproofing warehouses containing highly inflammable commodities. It is instructive to know that poor Braidwood to the last protested against the use of cast-iron in the construction of our great river-side warehouses. In the paper he read at the Institution of Civil Engineers, in 1849, 'on Fireproof Buildings,' he denounced the use of this untrustworthy material in the most decided manner, and pointed out that some great calamity must enevitably befall the men of the Fire Brigade, sooner or later, in their attempts to extinguish the vast conflagrations which were likely to take place in these extensive buildings. His own destruction has been the first testimony to the correctness of his views. The fire raging in one of these warehouses can only be compared to that of a blast furnace, and in consequence the cast-iron pillars speedily become red hot, the water from the hose falling upon these pillars suddenly contracts and snaps them like so much glass, and, of course, the floors fall in at once. There is another danger to those outside these warehouses. The massive girders of cast-iron supporting the flooring of course expand with the heat; and no walls, however strongly built, can possibly withstand their lateral thrust, and down they come, to the destruction of those near at hand. We have no doubt whatever that this was the cause of the falling of the wall which killed poor Braidwood. It was proved on the inquest that there was no saltpeter in this part of the building: it was also proved that no explosion took place here at all. It has been suggested that the walls were burst out by the swelling of the cotton bales; but it is quite needless to attempt such an explanation when we know that the iron girders, heated to a white heat as they were, must have elongated nearly half a foot, pressing before them the solid wall."

The French at the Industrial Exhibition.

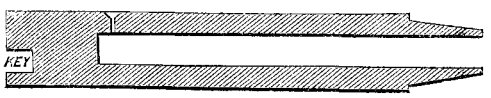
An Imperial Commission has been named, with Prince Napoleon at its head, and including several of the Ministers of State, all of whom are reported friends to free trade and the English alliance, to represent France at the next World's Fair. The President has issued a circular calling on French manufacturers and artists to do their utmost to uphold the banner of France in the approaching competition, setting forth the benefits that have accrued from those of 1851 and 1855, and counting among the valuable results of these peaceful struggles, the strengthening of the alliance between two great nations, and the establishment between all others of that commercial solidarity before which prejudices, distrust and rancour will gradually disappear. It closes with expressing the hope that French industrialists will leave off their habit of expecting the government to take the lead in everything, and adopt that of initiating for themselves the improvements needed in their several branches.

© 1861 SCIENTIFIC AMERICAN, INC.

Chinese Guns.

MESSRS. EDITORS :—The wrought-iron Chinese gun, of which there is an engraving and description in the last number of the SCIENTIFIC AMERICAN, is called in China a "jingal," and is probably the best firearm the Chinese possess—their cast-iron cannon, as a general thing, being more dangerous to the gunners than to an enemy, and their matchlocks are nearly as bad. There is one of these jingals complete in the Chinese museum—exhibited in Boston, Philadelphia, and this city a few years since—which is such as are used on the Chinese revenue cutters, and has a forked pin attached to the trunnions to secure it in the rail of the vessel, and allow the muzzle free motion vertically and horizontally.

The whole length of this jingal, including a short stock, is 6 feet. The barrel is 3 feet 6 inches long, and the bore $\frac{7}{8}$ in diameter. It has three separate chambers accompanying it (which, I believe, is the



usual number), by which rapid firing can safely be maintained, two being cleaning and loading while the third is fired. Accompanying is a drawing of a longitudinal vertical section of one of the chambers. A handle, made of $\frac{1}{2}$ inch round iron bent in a semicircle, and rigidly secured by the end at about the middle of the chamber, stands at an angle of 45° to the vertical section of the chamber, when placed in the gun, so as not to obstruct the sight.

It would seem that such guns, if well made and rifled to fire conical balls and bolts, mounted on light wheels, to be worked and moved by two or three men each, would be very destructive instruments at ranges where even the improved muskets and rifles would be of little use. J. R. PETERS.

New York, July 29, 1861.

Wealth of the United States.

MESSRS. EDITORS:—I see that the Secretary of the Treasury estimates the total wealth of the country, in his last report to Congress, as—

Real estate	$11,272,053,881
Personal property	4,830,880,235
Total	$16,102,934,116

of which there is in the loyal States $10,900,758,009. Now I would very much like to know where he gets these figures. Inclosed I send you an estimate of my own, and the base annexed, in which I make it to be $15,000,000,000. Will you oblige me by publishing in the SCIENTIFIC AMERICAN the true amount of property in the States and Territories? If Mr. Chase's estimate is true, we are now worth about $17,000,000,000; Great Britain and Ireland, according to the January number of the *Edinburgh Review*, $30,000,000,000; France, by the same authority, $14,000,000,000, I estimate the present worth of the Russian empire at $10,000,000,000; Austrian empire, $9,000,000,000; and Germanic Confederation, $15,000,000,000, which would make us the second richest country in the world, and which will give us, in 1870, $43,000,000,000, or $1,000 a head, and make us *the richest* country on the globe. If you can get the grounds of Secretary Chase's estimate for States, &c., please publish them, and oblige many who would be glad to know how we stand.

FREE STATES.

		Official value several years ago,	*Estimated value by me.*
1858.	Maine	$162,472,914	$200,000,000
1858.	New Hampshire	103,804,326	1,125,000,000
1858.	Vermont	86,775,213	110,000,000
1860.	Massachusetts*	1,047,936,995	1,100,000,000
1858.	Rhode Island	111,175,174	125,000,000
1858.	Connecticut	211,187,683	250,000,000
1858.	New York	1,414,907,697	2,450,000,000
1858.	New Jersey	175,150,000	225,000,000
1850.	Pennsylvania	722,486,120	1,200,000,000
1859.	Ohio	840,800,031	900,000,000
1859.	Indiana	470,204,964	500,000,000
1859.	Illinois	407,477,367	500,000,000
1856.	Michigan	120,362,474	†240,000,000
1856.	Wisconsin	152,537,700	†260,000,000
	Minnesota	.....	100,000,000
	Iowa	140,444,533	†250,000,000
1859.	Kansas	28,000,000	30,000,000
	Oregon	.....	25,000,000
	California	131,306,269	175,000,000
	Total		$9,776,500,000

* Includes $150,000,000 escaped observation.
† Too low.

TERRITORIES.

	Utah	.....	$18,000,000
	Colorado	.....	3,000,000
	Dacotah	.....	1,000,000
	Nebraska	.....	10,000,000
	Washington	.....	5,000,000
	New Mexico	.....	9,000,000
	Nevada	.....	4,000,000
	Total		$50,000,000

SLAVE STATES.

	Maryland	.....	†$450,000,000
1859.	Virginia	1,043,965,928	1,150,000,000
	North Carolina	.....	400,000,000
	South Carolina	.....	650,000,000
	Georgia	609,589,876	700,000,000
	Alabama	.....	†600,000,000
1856.	Florida	49,461,466	75,000,000
	Mississippi	.....	500,000,000
	Texas	192,387,377	300,000,000
1856.	Arkansas	88,049,415	110,000,000
	Tennessee	260,319,611	435,000,000
1855.	Missouri	320,055,193	†450,000,000
1859.	Kentucky	493,409,363	525,000,000
	Delaware	.....	63,000,000
	District of Columbia	.....	30,000,000
	Louisiana	.....	425,000,000
	Total		$6,863,000,000
	National property in Washington		30,000,000
	State churches and schools		292,000,000
	Grand total		$15,000,000,000

† Too low

SOUTHERN KALFUS.

Louisville, Ky., July 17, 1861.

[The Secretary gets his facts from the returns of the census of 1860.—EDS.

Power of Railway Brakes.

MESSRS. EDITORS;—There appears to be a great difference of opinion respecting the power and application of brakes on railway cars. While looking over some of the numbers of the old *Railroad Advocate*, a few days ago, my attention was arrested by an article headed "Power of Brakes," in which it is stated that when brakes are applied *hard*, the train slides or moves more easily than if the wheels continued to turn. An explanation of this action is given to the effect that the principle of greatest friction was in proportion to the largest surfaces. For my part I was not aware there was any such principle in mechanics. If it is true that a wheel will slide more easily than it will roll, what great mistakes we do make in putting cars and wagons on wheels instead of upon runners. It is a fact, however, that about two-thirds of the railroad men of the present day really believe that a car will go further with the wheels sliding than when the brakes are applied—press lightly upon the wheels, but still allow them to turn. There are also some queer ideas prevalent respecting the mode of applying brakes so as to get the best effect from them.

A few days since a person who holds a high position on one of our great railroads, in speaking of a new brake that has been applied on the top of the wheel, said it was better than to apply it to the side in the common way. He stated that brake blocks on the side of the wheels were generally hung below the centers of the axles, and the effect of this arrangement was, that when they were tightened, they tended to raise the wheels from the track, thus preventing the friction that ought to be obtained between the wheels and the rails. I could not help thinking when hearing these remarks of the man who got into the basket and tried to lift himself up by the handles.

I think it is high time that the correct action of railroad brakes was properly understood. My opinion is that when the brakeman tightens his brakes in such a manner that the wheels slide, he has done all that he possibly can to stop the train.

I consider the idea erroneous that a brake is more effective, when not applied quite so tight as to make the wheels slide. The friction caused by the wheels sliding on the rail must offer the greatest resistance to the car moving forward, and thus it must be stopped in the shortest possible space. The brakes, therefore, should be applied rapidly to stop the wheels revolving, and make them slide, when the train has to be stopped suddenly. In order to save the tread of the wheels and the face of the rails, where there is plenty of space for stopping the train, the brakes should not be applied so tight as to make the wheels slide, but merely to arrest the speed of their rotation.

G. W. L.

Weedsport, N. Y., July 25, 1861.

Wire from Aluminum.

It has been found that aluminum is easily capable of being manufactured into wire. For this purpose, the ingots are run into an open mold, so as to form a kind of quadrangular shape of a little less than half-inch section, which is then beaten upon the edges by the hammer very regularly; the operation of drawing out is then commenced on a horizontal bench, by very gradually reducing the diameter of the metal intended to be drawn into wire, and, by frequent reheating, the ordinary process of wire-drawing can be proceeded with. When the threads are required extremely fine—as for example, for the manufacture of lace—the heating becomes a very delicate operation on account of the fineness of the threads and the fusibility of the metal. The heat of the current of air issuing from the top of the glass chimney of an argand lamp suffices for the heating. It is found that the elasticity of aluminum is very much the same as that of silver, and its tenacity also about the same. The moment after it has been melted, aluminum possesses about the hardness of pure silver; when it is hammered out, it almost resembles that of soft iron—it becomes elastic, acquiring, at the same time, considerable rigidity.

COTTON AND WOOL.—The Cleveland Wool Depot Co's Circular for the present month says :—"The active demand for coarse wool which has characterized the trade for the last month, still continues, and at full prices with the prospect that the incoming clip of coarse and medium will be eagerly sought for, whilst there is no demand for fine except at prices paid for inferior grades. The highest price we have heard paid for the new clip is forty cents. Merchants and wool growers probably know that this change is brought about by the entire capacity of the machinery being taxed to manufacture government goods. We shall, therefore, expect to see fine wools neglected for two or three months. No cotton can now be had from the South, and how far this will influence the use of all wool where cotton has been used in part, or as a substitute, cannot be stated, but the presumption is that the want of it will favorably affect the trade in wool."

AMERICA AT THE NEXT WORLD'S FAIR.—A resolution has passed the Senate and House of Representatives, appropriating $2,000 in order that the President may adopt measures to insure a representation of the United States at the next World's Fair, to be held in London in 1862. A representative should be appointed as soon as possible, in order that he may make arrangements for the space required by American exhibitors. We do not expect that there will be many exhibitors from our country, but those who do go should be provided with good positions and the means to make a display creditable to our people. The building for the World's Fair is now in the course of erection, and it is going up with that rapidity and system which were observed in the first Crystal Palace. It is expected that the exhibition will surpass all that has preceded it in the character of the mechanism and articles entered for competition.

AN ENGINE DRIVER'S PRESENCE OF MIND.—The Stettin (Prussia) newspapers mention an instance of heroic presence of mind, which deserves to be known wherever railways exist. A passenger train, coming from Altdam, in full speed, was running direct into the river Oder, at a place where it is twenty feet deep, in consequence of a mistake on the part of the pointsman at a crossing. An engine driver, one Kampke, of Konigsberg, who was on a sliding, with a locomotive and two wagons of goods for discharging into a boat on the river, saw the mistake and the danger. Without a moment's hesitation, he put on full steam, and, rushing forward, charged the coming train. The shock was tremendous, but the passenger train was brought to a standstill, without the slightest injury to any one.

VELVET-BLACK VARNISH FOR ZINC.—M. Boettger, in the *Journal de Pharmacie et de Chemie*, gives the following receipt for covering zinc with an adhering velvet-black varnish :—Dissolve 2 parts by weight of nitrate of copper and 3 parts of crystallized chloride of copper in 64 parts of distilled water. To this add 8 parts hydrochloric acid of 1.10 density, and stir all up thoroughly, and plunge the zinc previously scoured with fine sand into it, hold it in for a very short period, take it out, wash it in cold water and dry rapidly. It will now be found that the surface is coated with a metallic alloy, of a beautiful black hue.

The government has at last taken steps to insure competency in the regimental officers. On the 24th of July, a general order was issued that all officers shall be subjected to a critical examination by a board appointed by the War Department, as to their fitness for command, and every one found incompetent shall be rejected.

AN earthquake occurred in Antigua, West Indies, on the 4th of July, by which, it is stated, 2,000 persons lost their lives.

© 1861 SCIENTIFIC AMERICAN, INC.

Cricket.

Though the famous English game of cricket is being introduced to a considerable extent in this country, we presume that few of our readers have ever seen it played, and in order to make the invention here illustrated intelligible, we will give a very brief sketch of the game.

The wickets consist each of three sticks driven into the ground in a line about three inches apart, and standing above the ground 27 inches. Two wickets are placed 22 yards apart. A player takes his stand near one of the wickets, and hurls a heavy leather ball at the opposite wicket, endeavoring to hit it. A player belonging to the opposite party stands just one side of the line between the two wickets, with a wooden bat in his hand about three feet long and four inches wide, to strike the ball and prevent the wicket from being hit. When he strikes the ball and knocks it out of the way, he runs over to the opposite wicket; passing on his way a fellow batsman on the same side who has been stationed at the opposite wicket, and who runs at the same time to the wicket which the striker has left. If each reaches his destination before the wicket to which he is running is hit by the ball, the run counts one in the game. There are eleven players on each side, the party that is trying to hit the wicket being called the "outs," and the other party the "ins." If the wicket is hit with the ball at any time while the batsmen are running from one wicket to the other, the batsman is out, and his place is taken by another member of his party; and when all of the party having the innings have been put out, they become the outs, and the other party the ins. The striker may run as many times as he can from one wicket to the other after he has struck the ball before it is brought or thrown to the wicket, and each run counts one in the game. The side beats that makes the most runs in two innings.

The sticks which form the wickets are called "stumps," and to indicate with certainty when they are hit, shallow notches are made in their upper ends and little sticks, called "bails," are laid across from one to another in a manner to be thrown off with the slightest jar.

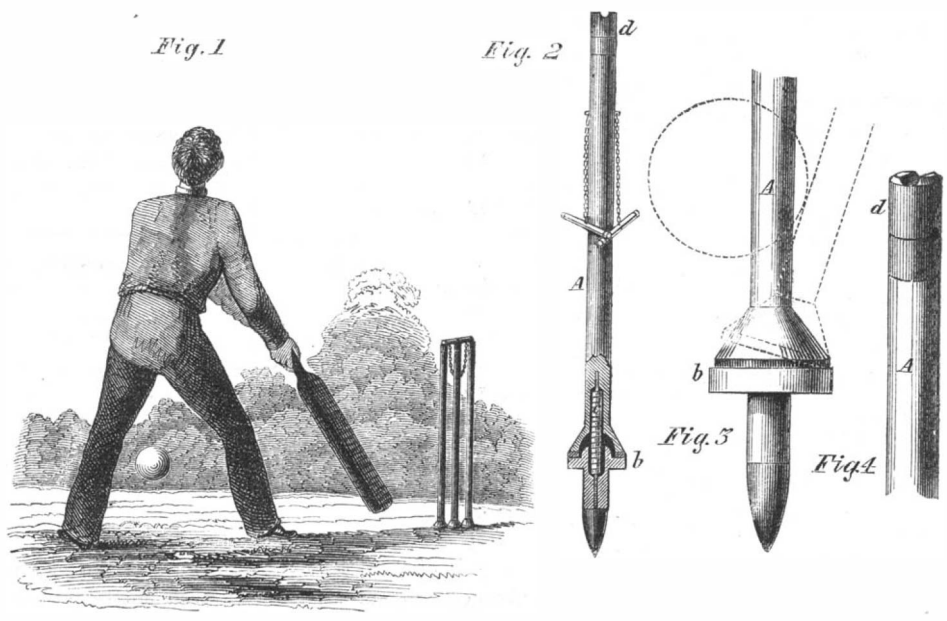
The stumps must, of course, be set in the ground with the notches parallel with the plane of the wicket, and the stumps are frequently drawn out of ground and driven in again more than once before this is effected. The stumps must also be reset whenever they are knocked over by the ball, and all of this resetting breaks up the ground, injuring its hold upon the stumps. The annoyance, too, of constantly rearranging the wicket, and picking up and replacing the bails, interferes with the game, tending to change it from sport to labor. To obviate these evils is the purpose of this invention.

The stump, A, Figs. 2 and 3, is made with an elastic joint at the surface of the ground, so that when it is bent from the perpendicular it will immediately return to its proper position without breaking the ground. The joint is shown in section in Fig. 2. The spike piece, *b*, which enters the ground has a shoulder to aid in supporting the stump, and is rounded at its upper end in the form of half a globe. The stump is enlarged at its lower end, and is hollowed out to fit over the semi-globular protuberance upon the upper end of the spike piece. The two parts are fastened together by an elastic tie, *c*, which may be either of india-rubber or of spiral steel wire. To make the joint soft and silent in its acting, a flat ring of india-rubber is interposed between the ends of the two pieces at the joint.

From this arrangement, it will be seen that when the stump is bent aside by the ball, as represented in dotted lines in Fig. 3, it will immediately resume its perpendicular position without demanding any attention from the players. As the bails will be thrown off whenever the wicket is hit, the labor of replacing them is facilitated by suspending them by chains to the side of the stump, as shown in Fig. 2; thus obviating the necessity of stooping to the ground whenever this frequently occurring task is to be performed.

To enable the notches for the bails to be arranged in line without changing the position of the stumps, each of the latter is crowned at its upper end with a brass cylinder, *d*, Fig. 4, which revolves freely on a spindle.

This most convenient and elegant cricket stump is the invention of Wm. Hanlon, one of the Hanlon Brothers, the famous athletes, whose wonderful and apparently perilous performances at Niblo's have thrilled the hearts of thousands of our citizens.

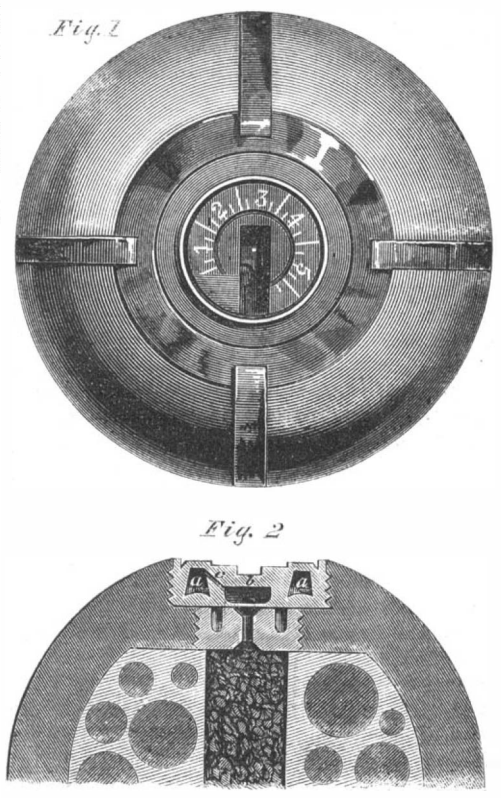


HANLON'S IMPROVED WICKET.

The patent for this invention was granted through the Scientific American Patent Agency, July 23, 1861, and further information in relation to it may be obtained by addressing Hanlon Brothers, Ninety-ninth street, Bloomingdale road, New York city.

THE SHRAPNELL SHELL AND FUSE.

We take from Commander J. A. Dahlgren's work on Boat Armament, the accompanying illustrations of



a shrapnell shell as now constructed, with the most approved kind of fuse in use.

Fig. 1 represents only half of the shell, which it will be understood is a hollow globe of cast iron filled with musket balls, sulphur and powder, and supplied with a fuse to set fire to the powder and explode the shell after it is fired from the cannon. The office of the sulphur is to hold the balls from rolling about in the shell and pulverizing the powder.

Shrapnell are intended for the destruction of soldiers alone, not for that of forts or buildings, and the shells are designed to burst at some little distance in front of the ranks at which they are fired; the musket balls with which they are filled continuing their flight with the same velocity that they had while in the shell, but scattering so as to produce an effect equal to that of the fire from a whole company of infantry. It will be seen that the effectiveness of shrapnell must depend almost wholly upon the point in its flight at which it bursts. If it bursts beyond the enemy it produces no effect whatever, and if it bursts too far short, the balls are so much scattered that many of them strike the ground, while others pass over the heads of the hostile forces.

Nothing in warfare is more surprising than the accuracy with which fuses are made to burn any length of time desired. The fuse is made of a composition of the same ingredients as gunpowder, but in different proportions, so that it will burn more slowly. It must be compressed with great force to prevent the gases from permeating the mass to make it burn only from the surface. The fuse is lighted at the instant of discharge by the heated gases which result from the combustion of the powder in the cannon, and which completely envelope the shell while it is in the gun.

Wonderfully accurate as the time of the burning of the fuse can be made, still, the adjustment required is so very nice, that one serious objection to the use of this projectile results from the difficulty of making it accurate enough. If the column of powder is compressed lengthways, it is very apt to be unequally compressed in different parts, and then some portions will burn more rapidly than others.

In the fuse represented in the cut, which was invented by Col. Borman, of the Belgian artillery, this is entirely obviated by compressing the column of powder sideways; and other advantages are secured which give it the preference over all other fuses at present in use.

The hole into the shell is closed by a metal plug, made of an alloy of tin and lead, formed to screw into the opening perfectly air-tight. In the outer surface of this plug a channel, *a a*, Fig. 2, is sunk to receive the fuse powder. This channel forms a large arc of a circle, and after it is fitted with fuse powder it is covered with a thin plate of metal graduated to seconds and quarter of seconds, as shown in Fig. 2. From one end of the channel a smaller channel, *c*, filled with rifle powder, leads to the circular recess, *b*, which is filled with musket powder and closed at the bottom with a perforated disk of tin.

The graduated plate which covers the fuse powder is so placed that the graduation commences over the end that communicates with the interior of the shell. Just before the shell is placed in the gun, a hole is cut through this covering plate at such point on the graduation as corresponds with the time which it is desired the fuse will burn before the shell bursts.

SEAMLESS SHOE UPPERS.—A patent has recently been taken out in England for making the leather uppers of shoes without seams, so as to save the expense of sewing, and, at the same time, obtain uppers that are never affected with the ripping-out disorder, which has become so common with uppers that are sewed with some machines. The method of making the seamless uppers is to cut them out the desired shape with the middle opening for the foot; then put each into a mold, where it is pressed into proper shape, ready for the last on which to sew the welt and sole. Shoes thus made are said to be more durable than most of those which have sewed uppers. The improvement will prove economical to the wearer.

© 1861 SCIENTIFIC AMERICAN, INC.

Scientific American

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY
At No. 37 Park-row (Park Building), New York.

O. D. MUNN, S. H. WALES, A. E. BEACH.

TERMS—Two Dollars per annum.—One Dollar in advance, and the remainder in six months.

Single copies of the paper are on sale at the office of publication, and at all the periodical stores in the United States and Canada.

Sampson Low, Son & Co., the American Booksellers, No. 47 Ludgate Hill, London, England, are the British Agents to receive subscriptions for the SCIENTIFIC AMERICAN.

☞ See Prospectus on last page. No travelingagents employed.

VOL. V. NO. 6.....[NEW SERIES.]....*Seventeenth Year.*

NEW YORK, SATURDAY, AUGUST 10, 1861.

KETCHUM'S REAPING MACHINE.---REFUSAL OF EXTENSION.

The rejection by the Commissioner of Patents of the application of William F. Ketchum for an extension of his patent of July 10, 1847, for an improvement in reaping machines, having excited considerable interest in the public mind, together with some criticisms, we are induced to make a few further remarks upon the subject, now that the decision has been published.

The Commissioner sums up his opinion with a statement of five distinct grounds on which he rejects the application. On reading this statement, it is obvious that if these grounds are well supported by the facts, there is little cause to impugn the decision. Hence the inference is plain, either that the application lacked intrinsic merits, or that it was defectively presented to the Commissioner.

The jurisdiction of the Commissioner of Patents in relation to extensions is very peculiar, and it is necessary that every application be prepared and presented by skillful and experienced counsel, and that the provisions of the statute, as well as the rules and former decisions of the department, be carefully observed and strictly conformed to.

The first reason assigned by the Commissioner for rejecting the application is that "the invention does not belong to the class of improvements for which, by their *eminent utility*, &c., the law chiefly designed the benefit of an extension." Certainly a valid reason, if well made out by the opposition, though the degree of the utility to be shown by the applicant is a different question, and the Commissioner's mind, in deciding it, will always be influenced by the other points in the case. Now let us see how Mr. Ketchum attempted to prove the "eminent utility" or "*ascertained* value" of his invention. As the Commissioner very justly says, "the patentee, or his witnesses, should have submitted facts for the enlightenment of the judgment" upon this point, "instead of such a vague and general statement" as that "grass harvested by the aid of my improvement is harvested at a saving of about *one dollar* per tun; and the value of my invention for one year, therefore, may be determined in dollars by the number of tuns of hay capable of being gathered in the United States by machinery."

No wonder the value of the invention thus arrived at is $100,000,000, which the Commissioner obliterates at once by an appeal to "the fact well known to all acquainted with farming, that the *whole expense of cutting, and curing and cocking hay*, whether by hand or by machines in use prior to the date of the applicant's invention, did not exceed one dollar per tun." Such extravagant estimates of the value of an invention never carry conviction to the mind, but leave a contrary effect. The Commissioner accordingly deems "the estimated value of the invention, set forth in the patentee's statement, in view of the state of the art and the limited scope of his claims, an extravagant fiction." This is scarcely surprising; yet it was entirely practicable for the applicant to have submitted, as other applicants do, a detailed statement of the actual value of his improvement, based upon *facts* properly proved. Had he done this, we should have seen no such conclusion arrived at by the Commissioner. There was some testimony on this point filed by Mr. Ketchum, but most if not all of it was legally incompetent.

The second reason assigned by the Commissioner for his decision, is, that the invention was not introduced into successful practice by Mr. Ketchum before he parted with his whole interest in the patent; and the assignees, by whom it has been introduced, if at all, have received from the public an ample and bounteous reward. A patent, under our laws, is to be extended only for the purpose of rewarding *inventors* "for the time, ingenuity and the expense bestowed upon the same, and the *introduction thereof into use.*" Of course, without clear proof that this was done by the inventor, there can be no extension. In this case the applicant did not show, as he should have done, that he ever introduced the invention into practical use or showed it available for any useful purpose at all. Yet he must have done so in *fact*, or nobody would have bought his interest in the patent.

The next reason assigned by the Commissioner is, that the applicant "had not exhibited a *true* and *faithful* account of the profit and loss accruing to him from and by reason of the invention." The account presented in this case was very general and meager, and it seems evident that a more full and accurate account could have been presented had Mr. Ketchum been aware of the great importance of this. The principal criticism of the Commissioner upon it is, that the applicant having proved by one witness that his time was worth $1000 per year, he therefore charges $5000 for five years' time, as though it were all spent upon this invention; whereas, during that period, he applied for four other patents for other improvements in reaping machines, and that he obtained two of them, and of course this must have occupied a portion of his time, for which no credit is given. These and other similar statements, the correct facts of which, it would seem, might very easily have been set forth, excited the suspicions of the Commissioner and destroyed his confidence in the applicant.

Another fact which also weighed strongly on the Commissioner's mind, was that the applicant voluntarily disposed of his invention without "any fact of hardship or necessity being made to appear;" and he does not show that before doing so he had brought his invention successfully into use, as it was his duty to do.

For these and other reasons which we have not space to refer to in this article, the Commissioner concludes that "it does not appear to his full and entire satisfaction that, without fault or neglect on his part, the inventor has failed to obtain from the sale and use of his invention a reasonable remuneration for the time, ingenuity and expense bestowed upon the same, and the introduction thereof into use," and the application is rejected.

And, as the case was presented to him, we cannot but assent to the correctness of the Commissioner's decision. Whether, by a more thorough and careful "statement and account," more full proofs of the needful facts upon which the Commissioner's opinion might rest, and a candid disclosure of the relations of the applicant with his assignees, concerning which there was an evident design of concealment, the case would have been changed, the public cannot judge but may surmise.

To one or two positions of the Commissioner we cannot assent. He wisely declines determining, as the case did not require it, "whether an extension can be granted to an inventor where it appears that the whole benefit of the extension will inure to assignees, who have already received an immense profit ($1,400,000) from the public during the original term of the invention," and says that "the object of the extension is to afford recompense to the inventor," &c. Yet he "strengthens the reason for rejecting the application" already given, by the remark that the extension is manifestly designed to inure to the benefit of the assignee above referred to, and this seems to be inferred from the fact that Ketchum had transferred to Howard, the assignee, "all and any improvement which he had invented, or might invent, upon any machine for cutting grass or grain," &c. And this the Commissioner construes to be "an assignment, on its face, of the whole benefit of any extension of the patent, to Mr. Howard."

Now it is well settled, by judicial decisions as well as those of the Commissioners of Patents, that no assignment of an invention or patent for the first term, carries the right to the extension, unless that right is expressly mentioned in the instrument, or is included by necessary implication. Mr. Ketchum had not, therefore, so far parted with his interest in the extension as to deprive himself of his right to the latter, if entitled to it in other respects. Nor, as we understand the matter, is it within the spirit and meaning of the Patent Laws, and of the construction put upon them by former Commissioners, to pay any regard, in applications for extensions, to what profit assignees may have made out of the patent during the first term, provided the inventor, to whom the law gives the extension, is the applicant for it, and provided he has, in all respects, fully complied with the provisions which the law imposes on him as conditions precedent to its granting the extension.

But as to these last two points, it distinctly appears that they did not cause the adverse decision. And the Commissioner's remarks upon them are, as he intends them to be, merely incidental.

Our opinion, therefore, is that the decision was in the main correct in law; and from a careful review of the evidence, we are forced to the conclusion that it was adverse to the patentee only because the merits which the application really possessed were not made to appear.

THE CONDUCT OF OUR SOLDIERS.

Napoleon Bonaparte once remarked, "It has been said that the victories of the French Republic were won by the new volunteers, who were inexperienced in war. There could be no greater mistake: they were won by the 180,000 old soldiers of the monarchy. You will not soon see me going to war with recruits." The same opinion of the inefficiency of raw levies has been held by nearly all experienced officers.

The case is entirely changed, however, if the troops can be placed behind breast-works; there they are apt to fight well. At Bunker Hill our troops were perfectly steady until the British got inside the lines, but then they ran as fast as their legs could carry them, in spite of all the endeavors of the officers to arrest them; General Putnam especially wasting a great many oaths in the effort. No braver commander ever lived than General Jackson, and in his dispatches before the battle of New Orleans he says distinctly that he shall not suffer his soldiers to fight until he can place them behind intrenchments.

The principal objection brought against volunteers is, that they are more subject to *panics* than veteran troops, and especially that when a panic commences it is more apt to spread to the whole army. This danger is sufficiently great in the oldest and best disciplined armies. As a general rule, when the lines are once broken the whole army takes to flight in utter confusion. The cases are rare in which any portion of an army has resisted the contagion of a panic occuring in another portion. The conduct of the Imperial Guard at Waterloo forms one of these exceptions, and that conduct will never be mentioned but with a thrill of pride by any Frenchman to the latest generations. After the rest of the army had fled in frantic terror, the Imperial Guard stood firm amidst their foes, refusing either to retreat or to to surrender.

Now, the fact to which we wish to call attention, which the whole community ought to understand and to appreciate, is this: When our troops were under a murderous fire, and though thousands of their comrades were running in wild confusion from the field, *several of the regiments did not catch the contagion*, but marched off the field only in obedience to the commands of their officers, preserving their thinned ranks in perfect order.

In all of our reading of history we have never seen this conduct paralleled by a large army of soldiers in their first battle.

LIGHT—M. Niepce de Saint-Victor has communicated to the Academy of Sciences, Paris, some further researches upon the persistent activity in light, the result of which tend to prove that this peculiar action, whatever it may be, is independent of chemical agency, and that light is without magnetic influence. M. L. Foucault said that the peculiar action of light observed by M. Niepce de Saint-Victor is an invisible radiation which behaves like a gas, inasmuch as it does not traverse glass plates. The idea of its being a phosphorescence cannot be sustained.

© 1861 SCIENTIFIC AMERICAN, INC.

GENERAL SCOTT NOT TOO BLAME.

In the House of Representatives on Wednesday, July 24th, Mr. Richardson, of Illinois, made the following remarks :—

I repeat that *General Scott has been forced to fight this battle.* I will tell him (Burnett) what occurred yesterday morning. My colleagues (Logan and Washburn) and myself were present with the President, Secretary of War and Gen. Scott. In the course of conversation, General Scott remarked, "'I am the biggest coward in the world." I rose from my seat. "Stay," said Gen. Scott; "I will prove it. *I have fought the battle against my judgment, and I think the President ought to remove me for doing it.* As God is my judge," he added after an interval of silence, "I did all in my power to make the army efficient, and I deserve removal because I did not stand up when I could and did not.

The New York *Times* makes the following statement editorially :—

We *know* that Gen. Scott was opposed to this plan of the campaign from the beginning; he deemed it unwise to make Richmond the main point of the movement; but after that had been decided against him, he was opposed to marching against it by the longest and most difficult route, through a country every foot of which would be obstinately defended, and which must be held by a strong force after it had once been taken. This we know to be true, and in spite of the delicacy of such disclosures, we shall not hesitate to state the authority for it. It is that of Gen. Scott himself.

On the Tuesday preceding the battle, Gen. Scott, at his own table, in presence of his aids and a single guest, discussed the whole subject of this war, in all its parts, and with the utmost clearness and accuracy. He had a distinct and well-defined opinion on every point connected with it; and stated what his plan would be for bringing it to a close, if the management of it had been left in his hands. The main object of the war, he said, was to bring the people of the rebellious States to feel the pressure of the government, to compel them to return to their obedience and loyalty. And this must be done with the least possible expenditure of life compatible with the attainment of the object. No Christian nation can be justified, he said, in waging war in such a way as shall destroy 501 lives, when the objects of the war can be attained at a cost of 500. Every man killed beyond the number absolutely required is murdered. Hence, he looked upon all shooting of pickets, all scouting forays not required in order to advance the general object of the war, all destruction of life, on either side, which did not contribute to the general result, as so many acts of unjustifiable homicide.

If the matter had been left to him, he said, he would have commenced by a perfect blockade of every Southern port on the Atlantic and the Gulf. Then he would have collected a large force at the Capital for defensive purposes, and another large one on the Mississippi for offensive operations. The summer months, during which it is madness to take troops south of St. Louis, should have been devoted to tactical instruction; and with the first frosts of autumn, he would have taken a column of 80,000 well-disciplined troops down the Mississippi, and taken every important point on that river, New Orleans included. *It could have been done, he said, with greater ease, with less loss of life, and with far more important results, than would attend the marching of an army to Richmond.* At eight points the river would probably have been defended, and eight battles would have been necessary; but in every one of them success could have been made certain for us. The Mississippi and the Atlantic once ours, the Southern States would have been compelled, by the natural and inevitable pressure of events, to seek, by a return to the Union, escape from the ruin that would speedily overwhelm them out of it. "This," said he, was my plan. But I am only a subordinate. It is my business to give advice when it is asked, and to obey orders when they are given. *I shall do it.* There are gentlemen in the Cabinet who know much more about war than I do, and who have far greater influence than I have in determining the plan of the campaign. There never was a more just and upright man than the President—never one who desired more sincerely to promote the best interest of the country. But there are men among his advisers who consult their own resentments far more than the dictates of wisdom and experience, and *these men will probably decide the plan of the campaign.* I shall do, or attempt, whatever I am ordered to do. *But they must not hold me responsible.* If I am ordered to go to Richmond, I shall endeavor to do it. But I know perfectly well that they have no conception of the difficulties we shall encounter. I know the country—how admirably adapted it is to defense, and how resolutely and obstinately it will be defended. I would like nothing better than to take Richmond; now that it has been disgraced by becoming the capital of the rebel Confederacy, I feel a resentment toward it, and should like nothing better than to scatter its Congress to the winds. But I have lived long enough to know that human resentment is a very bad foundation for a public policy; and these gentlemen will live long enough to learn it, also. I shall do what I am ordered. I shall fight where I am commanded. *But if I am compelled to fight before I am ready, they shall not hold me responsible.* These gentlemen must take the responsibility of their acts, as I am willing to take that of mine. But they must not throw *their* responsibility on my shoulders."

We thank the editor of the *Times* for publishing these facts. They have produced a great effect upon our minds, and we have no doubt they will on the country generally. We were amazed at the statement that General Scott, with his knowledge of the circumstances, ordered the attack at Bull Run. And now it seems that he was overruled in the matter. If the descripeions which we have received of the fortifications are correct, no troops, could have driven Gen. Beauregard out of Manassas Junction by an assault on the front of his intrenchments. The position was simply impregnable. That our veteran tactician had ordered an attack on such a position by forces vastly inferior to its defenders was credible only on the supposition that his mind had suffered from the depredations of age. The above statement, however, shows indisputably the state of the facts. Gen. Scott merely obeyed orders, the first duty of a soldier. He is a subordinate, the President of the United States being the Commander-in-Chief of the army.

The truth is, the country became very naturally impatient at seeing the rebellion so slowly consolidating itself without any apparent vigor in the efforts to put it down, and a pressure was brought to bear on the President and Cabinet perfectly irresistible, and they took the responsibility of upsetting Gen. Scott's plans. We all now see that this was unwise. The maxim that "Too many cooks spoil the broth," is especially applicable to military operations. When the French Directory appointed a colleague for Gen. Bonaparte in the command of his army, the latter immediately resigned his commision, writing to the Directory that one poor general was better than two good ones. In executive affairs, it is better to have even a defective plan steadily carried out than it is to be changing from one plan to another, though each may possess decided advantages over its predecessor. Gen. Jackson used to say that after he had taken a step, if it proved to be wrong, he found it all the more necessary to persevere in it.

The restlessness of the people has received a severe rebuke, and we shall all now be ready to wait in patience until the preparations for movements can be perfected. All that we ask of the government is, that the military dispositions shall be placed entirely in the hands of Gen. Scott, and then the nation will carry them out with the tremendous vigor of those popular efforts that republics only can put forth.

The comprehensiveness, transparency, distinctness and vigor of the above conversation show that the mind of Gen. Scott is not affected by age. The old warrior's intellect is as clear, his plans as definite, and his purposes as firm, as at any period of his life, and it is an immense satisfaction to learn that there is no blot on his military fame.

FIRES---A STUPID NEGLECT IN ENGLISH RAILWAY MANAGEMENT.

A short time since, a celebrated English racehorse was consumed by fire while being carried upon a train of the Great Northern Railway. The car in which the animal was confined took fire from a spark of the engine; the two grooms that were with the horse saved their lives by scrambling to the front of the truck, but as they had no means of communicating with the engineer, the flaming car was rushed on, and the train was not stopped until some laborers repairing the rails on the line made signs to the engineer that something was wrong. It was then too late, as the poor animal was reduced to ashes. The London *Engineer* justly says in reference to this accident:—

Had there been a bell cord throughout the train in reach of every passenger, as there is now on many German and on all American lines, the attention of the guards would have been called before the fire had made any considerable headway. Last month a Mr. Vernon, with several other passengers, came very near being burned in a first-class carriage of the London and Northwestern Railway. The train had to stop, providentially, at Blisworth, and before the passengers had been fairly singed they arrived, when the danger was made known.

It is surprising to us that the simple arrangement which is employed for signalling to the engineer in American railway trains has not been applied in England, because its utility is well-known to English engineers. The neglect to adopt such a measure of safety affords evidence of stupidity on the part of those who manage English railways.

An important lawsuit has lately been decided in the Court of Queen's Bench against this very company for causing the death of Mr. F. L. Pymn, a wealthy gentleman, and £13,000 (about $65,000) damages were awarded to his widow and eight children. The deceased had been a passenger in an express train, and while it was crossing one of the tracks at a station (not stopping) at the rate of 50 miles per hour, a wing rail broke, which caused several carriages to commence swinging fearfully, and the one in which the deceased was, a passenger car, fell over on its side and was dragged 146 yards, during which period Mr. Pymn was killed. The rail which broke down had a double flange, alike on top and bottom, so as to permit it to be turned upside down to do double duty. A short period before the accident, the top flange of the broken rail had been placed underneath, as it had been injured, and was unfit for duty on the surface.

The English courts and juries do not hesitate to hold railway companies responsible for heavy damages for all accidents that occur to passengers, whether caused by defective machinery, rails, material or the carelessness and incompetency of employés. The utmost vigilance should be exercised by all railway companies everywhere to keep every part of the track perfectly secure. Accidents are more frequent on American than English railways. Were such damages as the above more often awarded, we would have fewer railway catastrophes, the majority of which, in all countries, are caused by stupid management.

In the construction of railways, the best of everything is certainly the cheapest in the long run. A defective wing rail, costing a trifle, cost the Northern Railway Company $65,000 in damages. We believe it is the general policy of every railroad company to use good materials and to exercise all proper caution, but immunity from accidents is sure to beget carelessness. If a bridge or rail has borne a train safely today, it is no proof that it will do so to-morrow; hence there should be the greatest possible care used in examining the track and bridges of all railroads each day. It is easy to see how accidents which have actually happened could have been avoided; it is the duty of companies to be vigilant in preventing them.

ELECTRICITY FOR EXPLODING GUNPOWDER

In a recent lecture in London by Professor Abeel, F.R.S., and Director of the chemical establishment of the War Department, he stated that an extensive series of experiments had been made for ascertaining the different forms of electricity which were the most advantageous for exploding gunpowder. The Ruhmkorff coil, by which electricity of high tension is obtained, he considered was the best. What is called the "magnet fuse" has been used very successfully in firing gunpowder with electricity. It consists of two fine copper wires, each covered separately with gutta-percha, then both placed alongside, and bound together with an outer coating. It is then cut into short lengths, exposing the copper wires at the ends. Moistened gunpowder is placed upon the terminals or ends of these fuses when placed in the mine that is charged with powder to be exploded. A spark of inductive electricity sent from a Rhumkorff coil fires the moist gunpowder at the end of the fuse, and explodes the charge with certainty. This moistened gunpowder is prepared by mixing the fine-grained quality with a dilute alcoholic solution of chloride of calcium. A large supply of such fuses, with prepared gunpowder and a large magnetic apparatus for generating electricity, furnished a portion of the equipment of the British army during the late China war and the obstructions to the expedition on the Peiho river were cleared away by electrical discharges.

An improvement in the magnet fuse has lately been made in rendering the priming composition more sensitive by using a mixture of phosphide and sulphide of copper and the chlorate of potash. This priming is put upon the terminals of the copper wire, and it is ignited with the smallest size of magneto-electric machines—such as the 6-inch horseshoe magnet and a rotating armature used in America for medical purposes.

The charges of powder which are used for blasting under water and in mines with electricity, are either inclosed in a tin case or a bag of india-rubber, with the magnetic fuse placed in the middle, and connected with the conducting wire to the magneto-electric machine which develops the sparks. For field and mining operations in military engineering, a magneto-electric machine is more convenient than a galvanic battery, and a very small apparatus, made with Beardslee's American cast iron radial magnets would, we think, answer admirably for such purposes.

SHEET IRON MANUFACTURE.—In rolling out sheet iron when heated, an enameled surface is imparted to it by sprinkling the proto-carbide of iron over it and rolling it into the metal. The proto-carbide of iron consists of one equivalent of iron, one of carbon and one of oxygen. It improves the surface of iron, and lessens its tendency to rust. A patent has been taken out in England by an American citizen for this improvement.

© 1861 SCIENTIFIC AMERICAN, INC.

MALARIA.

There is no other subject that approaches in importance, at the present moment, the one that we have named at the head of this article. On it depend not only the lives of thousands of our soldiers, but also the efficiency of our military operations, and hence the fate of the nation. To carry on war with sick soldiers is simply impossible. The attempt to do it is quite as absurd as that famous expedition of the crack-brained French knight who went to fight against the *south wind*.

The sickly season of malarious districts has just commenced, and it will continue for three months. Camps that are located in such districts during August, September, and October, will become mere hospitals. The one condition necessary to keep our soldiers in condition to make marches and fight battles is to place them in healthy localities during the sickly season.

There are plenty of locations in the country easily accessible by railroads and steamboats from the theater of war, where fever and ague is wholly unknown. In some of these, camps may be established for the great mass of the soldiers, in which they can be drilled and trained for two or three months, and kept in the highest condition of health and vigor, ready to move down in the Fall upon the plains of the South, which will then be perfectly healthy, in a state of efficiency which will sweep all before them.

But if large armies are now marched into malarious districts, they will soon become so sickly that they will be unable to accomplish any thing. A man with bilious fever or chronic diarrhea cannot perform military duty; and even a moderate percentage of sick in a hostile community effectually obstructs the movements of an army.

The camps which must necessarily be kept up in sickly districts, like that at Cairo, will, before the season is over, unless the most energetic precautions are adopted, fill the newspapers with details of disease and death that will sicken the hearts of the community. Even the camp south of the Potomac, though the region around Washington is not badly infected, will demand all the efforts of our Sanitary Commission. If the men are kept sweating under their heavy uniforms through the day, and have to sleep in the same clothes at night; if no pains are taken to insure personal cleanliness; if they are fed on greasy and half-cooked food; and especially if they are allowed a free run of whisky, they will die like sheep with the rot.

We have already advised the soldiers whose camps are in malarious regions, to take a little quinine every morning through the months of August, September and October; and we now respectfully suggest to the colonels or surgeons of the several regiments, as a better plan, to have a small quantity of this prophylactic mixed once a day with the coffee of every mess. This we recommend, not as a substitute, but in addition to those other sanitary measures which have been found so effectual in preserving the health of armies.

RIFLE SHOOTING IN ENGLAND.

Great attention is now given by the people of England to acquire skill in the use of the rifle, and laudable efforts are made, by those in authority offering prizes, to foster and encourage this spirit. The whole nation appears to have become a vast volunteer corps of riflemen. No less than 300,000 volunteers have become organized into regiments, companies and squads throughout the different cities, towns and counties, and for the past two years nearly they have been drilled under experienced officers and fuglemen belonging to the regular army; and now, it is stated, that in point of drill they rival the regiments of the line, while they far surpass all the soldiers of Europe as marksmen.

In the regular army there is a school for training soldiers to shoot with the rifle at marks ranging from 200 to 900 yards distance, but this practice is limited in comparison with that of volunteer riflemen who can fire away at their own expense as they please. To give unity and coherence to the different regiments, they have formed a "National Rifle Association," which holds an annual meeting to contend for prizes at Wimbledon Common, near London. The best rifle shots of all the volunteer regiments and companies in the Empire contend for victory on these occasions, the second of which took place on the second week of last month and continued for three days. The highest prize was the "Queen's Silver Cup," valued at £250, which was awarded to the best shot; the "Prince of Wales Prize," valued at £100; "Duke of Cambridge Prize," £50; twenty prizes of Whitworth rifles, each worth £25, besides numerous smaller prizes. The Queen's prize is only allowed to be contended for by those who have made the best shots at the successive distances of 200, 500, 600, 800, 900 and 1,000 yards. Seven shots were allowed to each trial, excepting the last, which was reduced to five shots. The twenty best shots at 200 yards received each a Whitworth rifle, and the best marksman of the lot a silver medal additional.

At 600 yards the best shot obtained the Prince of Wales prize, and at 1,000 yards the best received the Queen's prize. The best shot at 600 yards was Capt. Robertson, of the 10th Perthshire rifles; the victor of all, who obtained the Queen's prize, was Mr. Joplin, of the Second South Middlesex Rifles, who scored twenty points at the ranges of 200, 500 and 600 yards, and eighteen points at the ranges of 800, 900 and 1,000 yards. He gained the prize just by one point from J. Bingham, of Bristol.

The shooting this year is said to have greatly excelled that of last year, and the prizes were taken by persons who had obtained all their knowledge of the rifle through their company practice. Each contestant had to fire with an Enfield rifle of the army up to 600 yards; then, for the ranges beyond this, Whitworth rifles were used, as the Enfield rifle cannot be relied on for such long distances. All those who gained seventeen points and upward had the right to contend for the chief prize, but none below this. The victor of the cup made a total of thirty-eight points out of forty shots.

The extreme range for target rifle shooting in England is four and a half times greater than the American, which is 220 yards.

As we understand the descriptions given in English newspapers of the rifle practice at Wimbledon Common, it surpasses the Swiss and American rifle shooting. When a bull's-eye of eight inches in diameter is struck in the center, it counts three points: when a bullet strikes within the circle of five inches it counts two points, and within one of twelve inches it counts one point. Mr. Joplin, the winner of the Queen's Cup, made thirty-eight points out of forty shots, four points being made with five shots at 1,000 yards, which is the best shooting ever made so far as we know. The rifleman, Mr. E. Ross, who won the first prize last year, was also a competitor for it this year; but he was beaten easily by forty others.

As a whole, the shooting of the English rifle volunteers was twice as good this year as the last. Our most accurate American rifles—those which are most esteemed for prize target shooting—are all muzzle-loaders, but the best rifles for long ranges used in England, seem to be breech-loaders. All the shooting is executed off-hand, no rest is allowed, and the rifles are the common kind used in the army drill.

HOW SHIP ARMOR PLATES ARE MADE.

The *Sheffield and Rotheram Independent* (English paper) describes the manufacture of armor plates for the war vessels of the British navy as conducted upon a large scale at one of the iron and steel establishments in Sheffield. The plates are made from slabs of bar iron, each 1½ inches thick, and measuring 30 by 12 inches. Four of these are first laid upon one another and heated to a white heat in a furnace, then rolled into a plate about four feet square. Step by step several plates are now put together, heated and rolled until four plates measuring 10 feet by 4 feet 4 inches and 2½ inches thick are made; then these four are heated, welded together and rolled, by one final operation making one massive armor plate 20 feet long, 4 feet 4 inches broad, 4½ inches thick and weighing 6 tuns or 180 lbs. to the square foot. Formerly armor plates were forged by a huge steam hammer, but it has been found that by using iron of different fibres, and rolling it from slabs, so as to have about 132 layers, the plates are tougher than those formed by hammering. This is certainly useful information to those who may be called upon to make out the specifications for the one or two armor-plated vessel, which, we understand, are about to be ordered by the Secretary of the Navy.

When one of these huge plates are rolled finally it is quite crooked, and has to be straightened. To do this it is placed on a long flat iron bed, and two immense rollers—each weighing nine tuns—are passed over it, in the same manner that plate glass is made. This levels the plate perfectly, and it is now left to cool. The plates after this are each lifted by a crane into a huge planing table, where they are cut true on the edges to the exact width of four feet, then they are tongued and grooved like pine boards for flooring, and are ready to be bolted to the side of the vessel.

THE COMET.

The publishers of *The American Journal of Science and Arts* have issued advanced sheets containing an article in relation to the comet which made its appearance in the northern sky on the 30th of June. Its elements have been calculated, and they bear no resemblance to those of any comet in the published catalogues; it is therefore a new one, whose orbit has never before been computed. When seen by inhabitants of our latitude it was on its way from the sun, pushing its tail before it—the tail pointing nearly though not exactly from the sun.

It had a small solid nucleus, somewhere from 150 to 400 miles in diameter. On the 2d of July the breadth of the head at the nucleus was 156,000 miles, and the length of the tail about 15,000,000 of miles.

Prof. Bond, of Cambridge says that by careful observation for two or three hours he discovered that the tail was double, there being a very faint curved ray in addition to the bright straight ray that was visible to all of us. The comet of 1858 had also a double tail, one straight and the other curved, but in that the bright tail visible to all was the curved one, while the straight ray was so faint that it was recognized at only three observatories, those of Pulkova, Göttingen and Cambridge, U. S. Astronomers are anticipating with great interest accounts of the observations made on the last comet at the observatory at the Cape of Good Hope.

Army Pay.

A subscriber inquires respecting the pay of officers and privates in the army. We published a full statement on the subject not long since, but repeat here the principal items. Lieut.-Gen. Scott's total monthly pay, inclusive of rations, is $758 per month; his aid-de-camps receive $195 per month each; Major-Generals, $457; Brigadier-Generals, $314 50; Colonels of Engineers and Dragoons, $229; Lieutenant-Colonels of the same, $205; Colonels of Artillery and Infantry, $212; Lieutenant-Colonels, $188; Majors of Engineers and Dragoons, $181; Captains, $134 50; Lieutenants, first and second and brevet-second, $125 83. In the Artillery and Infantry, Majors receive $169; Captains, $115 50; and First Lieutenants, $105 50; second and brevet-second Lieutenants, $100 50. The Surgeon-General is paid $228 33 per month, and his assistants from $217 to $117 83, according to their time of service. The older surgeons of course receiving the largest pay. The Paymaster-General receives $228 33, and common Paymasters $181 per month. Non-commissioned officers are paid as follows, by the act of August 4, 1854: Sergeant-Majors, Quartermaster-Sergeant, chief musician and ordnance Sergeant, $21 per month; first sergeant of a company, $20; all other sergeants, $17; artificers, $15; corporals, $13; musicians and privates of dragoons, $12; musicians or private of artillery or infantry, $11—one dollar per month of each privates pay being retained to the expiration of his term of service.

Cotton in India.

Mr. Edward A. Newton, of Pittsfield, Mass., who resided many years in India, has some very interesting statements in the Pittsfield *Eagle*, on the supply of cotton from the East. He quotes the following extract from a letter written by Mr. W. F. Stearns, son of President Stearns, of Amherst College, who is a merchant in Bombay, India, dated the 12th of April:

I went into the interior a few weeks since, as far as Sholapore, and found that the natives throughout the country had heard of the troubles in America, and that the amount of land which had been laid out and planted by them, with cotton, was somewhat astounding. My word for it, founded on personal observation, if the secession movement continues, in five years India will expor 4,000,000 bales. The quality is constantly improving, and the means of transportation are becoming so easy that the South will not be able to command the monopoly of the staple out of the Union."

© 1861 SCIENTIFIC AMERICAN, INC.

Military Terms.

The following definitions of military terms very commonly used by writers, will be of service to many persons in reading descriptions of battles and military operations :—

Abatis are rows of felled trees deprived of their smaller branches, the remainder interlaced and employed for the defense of redoubts, isolated posts, or for blocking up roads.

An Adjutant General is the principal organ of the commander of an army in publishing orders. He has the charge of the army correspondence, &c., and among his active duties are the establishment of camps, inspection, control of prisoners, and making reconnoissances.

Ambulances are flying hospitals for the conveyance of the wounded with the march of the army.

Barbette.—Guns are said to be in barbette when they are so elevated that, instead of firing through embrasures, they can be fired over the crest of the parapet. The result is a wider range.

Embrasure.—An embrasure is an opening out in the parapet, through which the cannon in a fort is fired.

Base of Operations.—A secure line of frontier or fortresses, from which advances are made and upon which troops may retreat.

Brevet.—In the United States army brevet means a commission to hold rank in the army at large, as distinguished from rank in a particular regiment or corps.

Brigade.—Two regiments of cavalry or infantry constitute a brigade.

Cadet.—A cadet is a warrant officer, and warrant officers rank below commissioned, exercising authority by warrant only

Caliber.—Caliber of bullets is determined by the number required to weight a pound ; of guns, by the weight of the shot used ; of columbiads, mortars, and howitzers, by the inches of their diameters.

Cartel.—An agreement for exchange of prisoners.

Casemate.—Vaulted chamber with embrasures for guns, and used in war as quarters for the garrison.

Defilading consists in raising the parapets of a fortress, so as to conceal its interior from the view of an enemy on an elevated position.

Deployment.—All tactical maneuvers intended to pass from close column to the order of battle, are deployments.

Division.—A division generally consists of two brigades, commanded by a major-general.

Enfilade.—To sweep the whole length of the face of any work or line of troops by the fire of a battery.

Escalade.—A place is taken by escalade when ladders are used to scale the walls.

Esplanade.—Empty space for exercising troops within fortifications.

Fascines.—Long cylindrical fagots of brushwood, used for strengthening earthworks or to make firm footing on marshy ground.

Flank.—The right side of a body of men or place. Thus, when it is said that the enemy, by a flank march, outflanked our right wing, it is meant that the enemy, by marching parallel to our line of battle, put himself in position upon our extreme right.

Foraging is often confused with marauding, but is the systematic collection of supplies by authority.

Inlying Picket—A body of men, in campaign, held ready to march when called upon.

Lodgment.—In a siege lodgment signifies the occupation of a position and the formation of an entrenchment to defend it against recapture.

Picket.—Literally, sharp stakes. Generally used to specify a detachment whose principal duty is to guard an army from surprise and oppose reconnoitering parties of the enemy.

Redoubts are works inclosed on all sides, generally square or polygonal.

Richochet.—Guns fired with a small charge and a low elevation throw richochet shots, which bound along the ground or ramparts.

Salient.—The salient angle of a fortification is an angle projecting toward the country.

Sally Ports.—Openings to afford free egress to troops for a sortie or sudden charge from a fort.

Sap.—The sap is a method of making trenches, in which the workmen are protected from musketry by sappers rolling a large *gabion* (*i.e.*, a cylindrical basket filled with earth) toward the enemy.

Shells.—A shell is a hollow shot, with a hole to receive a fuze or slow match, and filled with powder to burst it at the end of its range.

Squadron.—Two companies or troops of cavalry.

Subaltern.—A commissioned officer below a captain.

Tactics is the art of handling or maneuvering troops. It is frequently confounded with *strategy*, which is the art of conducting war.

Videttes.—Sentries upon outposts, placed to observe movements of the enemy and to communicate by signal.

Wine Making

CURRANT WINE.—To make currant wine of first quality, and that which *will not sour*, it is essential that the currants should be picked in a clear, dry day, and when *fully ripe*, but not over ripe. If over ripe, they are usually shrivelled a little, and are then unfit for first quality wine. The juice should be expressed from them as soon as possible after gathering, and before fermentatiou commences, which may occur in one or two days after they have been picked in warm weather. In a small way they may be crushed with the hands, or bruised in a tub and the juice expressed in a coarse cloth by squeezing with the hands. On a larger scale they may be crushed in a small portable cider mill, and the juice extracted in a press.

To every gallon of the juice add two gallons of clear soft water, and to every gallon of this mixture add four pounds of coffee crushed sugar. Put this mixture, after the sugar is thoroughly dissolved, into a clean keg or cask, according to the quantity you have, and fill up so the liquid comes up even with the top of the bunghole ; this is to allow the scum and impurities thrown to the surface during the process of fermentation to escape. You must manage to have left over a little of the mixture, perhaps a quart will answer, for the purpose of filling up the vessel three or four times a day, as it gradually loses in quantity by the process of ejection at the bunghole, and evaporation. Let the fermentation continue about the period before named, then close up the cask before the fermentation has entirely ceased, but after the most violent stages of it have passed by. This can be ascertained by placing the ear to the bunghole, and listening to the singing of the effervescence and noting its gradually diminishing action and force. On closing, drive in the bung tight, and let it remain at rest until the February or March following, when, if it is perfectly fine and transparent, it may be drawn off and bottled. If it is not fine, it may be made so by adding to every gallon of the liquor one-quarter ounce of sulphite of lime. Draw a quart or so of the liquor and dissolve the sulphite, and return the same to the cask, and mix thoroughly by stirring and shaking. In the course of one or two months it will become perfectly fine and bright. When, however, everything works favorably no fining is required.

After the foregoing recipe we have succeeded in producing a wine much approved and admired by all who have partaken of it ; the only objection made was in being a little *too sweet*, but this will, in a measure, wear off by age.

ELDERBERRY WINE.—The berries, when ripe, are picked by the stems, then stripped with the hands, or trimmed with shears. Next they are mashed fine, which can be done by means of a pounder, similar to those used for pounding clothes. Let them remain until the next day when the juice is pressed out in a cheese press, or any other convenient way. Next, boil the juice twenty minutes ; skim it, and add four pounds of sugar to the gallon. When milk-warm add a small piece of bread crust that has been dipped in yeast. Let it stand three days, remove the crust, and the wine is ready for bottling. Age improves it. Some add spices to the liquor when boiled. This is a great favorite with the English.

[The above is by Mr.C.N. Bement, of Poughkeepsie, and contributed to the *Country Gentleman*. Its author perfectly understands the art of making wine from currants and common fruits, and speaks authoritatively on the subject.

ARTIFICIAL IVORY.—Take amber 12 oz., Kourie gum 3 oz., and dissolve them in wood spirits or common alcohol ; then add to this 7 oz. of fine China clay and mix them thoroughly together by stirring, aided by a gentle heat, and the composition may then be placed in dies and made into various forms.

Competition for the Contracts for Army Wagons and Harnesses in Ohio.

The Cincinnati *Gazette* has the following statement of the proposals for army wagons and harnesses, and the rates at which the Ohio Military Board has made the contracts:—

PROPOSALS FOR ARMY WAGONS.

W. M. Taylor, Columbus, Ohio, ten at $105 ; conditions, one month.

Ellifritz & Thomson, Wheeling, Va., twenty at $90, according to specifications.

Ball, Ward & Co., Newark, Ohio, twenty at $85, according to specifications.

Busby, Little & Co., Wheeling, Va., twenty-five at $73, at Wheeling within twenty days.

Busby, Little & Co., Wheeling, Va., twenty-five at $73, at Wheeling within one week.

Beek & Pringle, Columbus, Ohio, ten at $84 75, according to specifications.

Beek & Pringle, Columbus, Ohio, ten at $90, according to specifications.

Hall, Brown & Co., Columbus, Ohio, fifty at $89, twenty-five within thirty days, balance in sixty.

Newark Machine Works, Newark, Ohio, ten at $89, according to specifications.

Chas. L. Southwick, Columbus, Ohio, forty at $73, according to specifications.

John McElroy & Sons, Delaware, Ohio, ten at $70, according to specifications.

G. R. March & Brothers, Lebanon, Ohio, twenty-five at $75, according to specifications.

William Spiekler, Dayton, Ohio, fifty at $75, according to specifications.

PROPOSALS FOR FIFTY SETS WAGON HARNESS.

Samuel Frye & N. Wilkinson, Newark, Ohio, fifty at $22, according to specifications.

W. B. & J. Blackburn, Lebanon, Ohio, forty at $21 50, according to specifications.

James Byon & J. F. Kinney, Columbus, Ohio, fifty at $21, according to specifications.

Lewis Greiser, Cincinnati, Ohio, fifty at $22 40, according to specifications.

Moores & Co., Cincinnati, Ohio, fifty at $21 90, according to specifications.

Thomas McBeth, Columbus, Ohio, fifty at $23 75, according to specifications.

G. W. Hawk, Mt. Vernon, Ohio, fifty at $21 95, according to specifications.

John B. Robb, Cincinnati, Ohio, fifty at $23, according to specifications.

Christian & Marshall, Cleveland, Ohio, fifty at $22, according to specifications.

S. R. Kyle, Milford, Ohio, fifty at $24 75, according to specifications.

John A. Matlack, Lancaster, Ohio, fifty at $22 25, according to specifications.

W. B. & J. Blackburn, Lebanon, Ohio, fifty at $20 50 ; according to specifications.

W. B. & J. Blackburn, Lebanon, Ohio, twenty at $21 50, according to specifications.

Montague & Rogers, Granville, Ohio, ten at $30, according to specifications.

George W. Cushman, Columbus, Ohio, fifty at $22 25, according to specifications.

William Burdell, Jr., and J. H. Montin, Columbus, Ohio, fifty at $22 75, according to specifications.

J. L. McGruder, Mechanicsburg, Ohio, fifty at $21 30, according to specifications.

Lyon, Whedon & Marshall, Hebron, Ohio, fifty at $23, according to specifications.

John D. Ball, Columbus, Ohio, fifty at $23 35, according to specifications.

James S. Wetherbee, Jr., Cincinnati, Ohio, fifty at $25 50, according to specifications.

AWARDS.

The awards upon these bids were as follows:—

To John McElroy & Sons, Delaware, Ohio, ten army baggage wagons, at $70 each.

To Charles L. Southwick, Columbus, Ohio, forty army baggage wagons, at $70 each.

To W. B. & J. Blackburn, Lebanon, Ohio, fifty sets harness for wheel horses, at $20 50.

A GALLERY, heretofore unexplored, has been lately discovered in the catacombs at Rome. The tombs and paintings found there belong to the three first centuries of the Christian era. In this gallery many glass vases have been found entire. They are made of two thicknesses of glass, of different degrees of fusibility. Between them are designs in gold, which have been so well defended by their transparent envelope, though made fifteen centuries ago, that they appear as distinct as when they left the workman's hand. The outer coat of glass is, however, rather oxydized in several places.

CAN SNAKES POISON ONE ANOTHER ?—It is generally believed that when one venomous snake bites another its poison is just as fatal to it as to a human being. M. Guyon, a member of the Paris Academy of Sciences, read a paper on this subject on the first of last month, in which he contradicted this notion. He said that his attention was first directed to this subject in 1843, and since that time had made a number of experiments with serpents, and found that when they bite one another they produce common wounds, not fatal poisonous bites. He asserted that travelers who have related marvelous stories the contrary of this have either been mistaken or have related myths.

© 1861 SCIENTIFIC AMERICAN, INC.

ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING JULY 16, 1861.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 4, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

1,810.—Wm. F. Armstrong and Morgan Payne, of Cardington, Ohio, for an Improvement in Churns :

We claim the peculiar arrangement of the dashers or wings upon the shaft, C C, as and for the purpose set forth.

1,811.—Benj. Arnold, of East Greenwich, R. I.. for an Improvement in Filters :

I claim the arrangement of the elastic bulb, A, with the valves, a b, filter, C, and tubes, B D, substantially as described and for the purpose set forth.

1,812.—V. G. Arnold, of Providence, R. I., for a Stud and Button Fastening :

I claim, first, The combination of the lever, B, spring, a, with the barrel, A, substantially as described, for the purposes set forth.

Second, I claim a stud or button fastening made with holes, substantially as described, for the purpose of being attached to a button, as a new article of manufacture.

1,813.—A. L. Bayley, of Amesbury, Mass., for an Improved Steam Trap :

I claim the arrangement, in the manner shown and described, of the double-armed lever, F, and bracket, E, with the valve, B, valve box, A, and pipes, C D, for the purpose set forth.

[This invention consists in a mode of applying a valve and lever in combination with the water escape pipe of a steam-heating or boiling apparatus, whereby the longitudinal expansion and contraction of the pipe is made to act through the lever with a multiplied effect upon the valve, for the purpose of opening and closing the same.]

1,814.—G. N. Beard, of St. Louis, Mo., for an Improvement in Iron Ties for Cotton Bales :

I claim the shape and proportion of the cleat, c, with respect to the loophole, d, substantially as described, for the purpose specified.

1,815.—A. W. Brinkerhoff, of Upper Sandusky, Ohio, for an Improvement in Shoes for Seed Planters :

I claim the combination and arrangement of opener, M, and coverer, P, constructed substantially as described and for the purposes set forth.

1,816.—C. A. Codding, of Augusta, Mich., for an Improved Cheese Press :

I claim, first, The perforated cylinder or curb, A, in combination with the hollow cylindrical plunger, C, provided with the perforated bottom, g, and side, openings, i, arranged to operate as and for the purpose set forth.

Second, Having the hollow plunger, C, doubled or turned over at its upper end, and provided with a wire or rod, j, in connection with the central tube, D, and having the cylinder or curb, A, secured to a hollow base, B, which is provided with a central tube, d, all being arranged as shown, for the purpose of rendering the cylinder or curb and plunger firm and durable, as set forth.

[The object of this invention is to obtain a cheese press which will admit of the ready escape of the whey from the curd when the latter is under pressure, and allow a current of air to circulate all around the curd.]

1,817.—G. A. Corser and A. O. Bundy, of Clappville, Mass., for a Skate :

We claim the arrangement of the double-armed and centrally-attached spring, G, with the foot stand, A, and runner, B, in the manner shown and described.

We also claim the locking of the ends of the foot stand, or either of them, in the manner shown and described, so as to throw the entire elasticity of the spring upon either end of the runner, or relieve both ends from the spring at pleasure, as set forth.

[This invention relates to an improvement in that class of skates wherein springs are interposed between the skate stock and runner, for the purpose of giving ease to the feet in using the skates, and obviating the jarring incident to the common stiff skate.]

1,818.—S. G. Crane, of Rochester, N. Y., for an Improved Combination of Camp Bed and Chair :

I claim the combination of the frames, A and B, with the pawls and cross rods, d, the adjustable roller and head, h, the graduated extension, C, by the key, P, and plates, r, substantially as and for the purpose specified.

1,819.—A. Doig, of Brooklyn, N Y., for an Improvement in Cooling Frictional Surfaces :

I claim the combination and arrangement of a journal box for the heavy shafting of steam engines, formed with an interior webbing and hollow spaces, constituting a cellular journal box, with water chambers to cool the frictional surfaces, substantially as and for the purpose set forth.

1,820.—J. W. Doughty, of New York City, for an Improved Feed-water Apparatus for Steam Boilers :

I claim, first, The hollow piston, A A′, having in the top and bottom the orifices, a a′, as described.

Second, The piston race, B b, in which the piston, A A′, by its reciprocating motion, brings the orifices, a a′, alternately in a line with the orifices, e e′, and the axis of the feed pipe, F F, as described.

Third, The induction pipe, E E′, by which the water is made to enter the piston through the lower orifice, e′, of the piston race, as described.

Fourth, The water line pipe, W W, which, having its lower end on the water line of the boiler, and the other end terminating in the feed pipe, F F, above the piston, A A, establishes an equilibrium of the pressure about the piston, and, at the same time, makes the feed water apparatus self-regulating by allowing the piston to discharge its contents into the feed pipe whenever the water gets below the water line, as described.

1,821.—A. P. Durant, of Atlanta, Ill., for an Improvement in Seeding Cultivators :

I claim the combination of a seeding machine, a corn planter and a cultivator in a single machine, arranged and operated in the manner described, and for the purposes specified.

And I also claim, in combination therewith, the attachment of the cultivator plows to a separate frame that may be shifted transversely by a lever when desired, substantially in the manner described.

1,822.—A. L. Fleury, of Philadelphia, Pa., for an Improvement in the Manufacture of Iron :

I claim the method described of treating iron, consisting substantially in destroying the chemical affinity by which the impurities are bound to the iron, by submitting the latter, while in a boiling state, to the simultaneous action of nitrogeneous substances and electricity, in the manner set forth.

1,823.—Joseph Evans, of San Jose, Cal., for an Improvement in Pruning Shears :

I claim the arrangement of the trigger, D, and the adjustable rod, C, in combination with the shears, A, and pole, B, constructed and oprrating in the manner and for the purpose set forth.

[The object of this invention is to construct shears adapted for pruning trees out of the ordinary reach of the arm, and capable of being operated while both hands can be used for steadying the pole to which the shears are attached.

1,824.—J. Q. A. Frazier, of Piqua, Ohio, for an Improvement in Harvesters :

I claim the arrangement and combination of the shield, M, endless apron, J, platform rake, L, ledge, O, and gravel rake, N, provided with the arm, v, and projection, z, substantially as and for the purposes specified.

I also claim the platform, composed of slots, P P P, connected with the adjusting plates, T and U, whereby said platform is capable of being adjusted up and down in a horizontal position or angularly, as may be desired, substantially as described.

1,825.—Benjamin F. Gold, of Reading, Pa., for an Improved Cooking Stove :

First, I claim the arrangement substantially as herein described of the oven chamber, H, hot-air chamber, G, and fire pot, J, the whole being inclosed by double plates packed with suitable non-conducting material, as set forth for the purpose specified.

Second, The regulating dampers, l, arranged in front of the stove in respect to the fire-chamber, and oven, and the flues above the same, as specified.

Third, The fenders, X and X′, packed with non-conducting material, and the shelves, 2 and 4, the whole being arranged within the oven chamber in respect to each other and the fire-pot, substantially as set forth.

Fourth, Making the shelves with corrugations increasing in width and depth, for the purpose specified.

Fifth, The deflectors, 5, on the underside and near the front edge of the upper shelf, for the purpose described.

Sixth, The tapering fire-pot, J, composed of two cylinders communicating with each other from top to bottom, said fire-pot having horizontal corrugations of the form described, and being arranged within the fire-chamber in respect to the oven chambers, and front boiler-holes, as set forth.

Seventh, The opening, or openings, 8, in the bottom plate of the stove, and the opening, 6, in the ash-pit, said openings being arranged in respect to each other on the fire-pot, as and for the purpose specified.

Eighth, The flues, T and T′, with an intervening packing of non-conducting material in combination with a regulating damper, r, for the purpose specified.

Ninth, The plates, P and j, extending in a curved direction from the plate, F, to cover the plate E, and otherwise arranged in respect to the front and rear boiler holes, as set forth.

1,826.—J. Goodspeed and C. Crawley, of Norwich, Conn., for an Improved Guide for Bombs, Lances and other Projectiles :

We claim the application of the metal sheath or cylinder as a guide to bombs, lances, or any other longitudinal instrument, as set forth in the above specification of our invention.

We also claim the application of cork as a guide to bombs, lances, or any other longitudinal instrument or projectile, as set forth in the above specification as our invention.

And we further claim the application of the metal sheath or cylinder and the cork, combined by covering the cork with the cylinder, as a guide to bombs, lances, or any other instrument, as set forth in the above specification as our invention.

1,827.—M. T. Greenleaf, of Quincy, Ill., for an Improvement in Pumps :

I claim the cylinder, A, formed of two parts, a b, of different diameters, in combination with the piston, B′, tubular piston, G, check-valves, F c, and receiving-valve, d, with or without the check-valve, E, and suction-pipe, D, for the purpose specified.

[The invention consists in the employment, or use, of a hollow piston-rod, in connection with two pistons, air and water chambers, receiving and check valves, whereby a simple and efficient suction and force pump is obtained.]

1,828.—M. R. Griswold and O. B. Bailey, of Watertown, Conn., for an Improvement in Swifts :

We claim the employment of a worm, or screw, j, or its mechanical equivalents, in combination with the pins, e, and slotted plates, f, to contract or extend the arms, d, substantially as and for the purpose described.

We claim the combination of the tubular screws, h, spring-braces, i, and slots, v, arranged and operating substantially as and for the purpose described.

We claim the combination of the nut, n, spring, u, collar, t, tube, p, arranged and operating substantially as and for the purpose described.

1,829.—C. E. Hale, of Millbury, Mass., for an Improvement in Skates :

I claim an improved mode of arranging and applying the spring or springs, the same being a continuation of the runner, fastened at the toe and heel of the foot-stand, rigidly or by a suitable joint, or secured to the foot-stand at any point, or points, whereby the result described may be obtained.

[The object of this invention is to construct a light and cheap skate—one that will be comfortable to the foot, and which will assist the skater in his movements, and accelerate his speed over the ice, with less exertion than with skates constructed previous to my invention.]

1,830.—Zebulon Hunt, of Hudson, N. Y., for an Improved Damper for Stove-Pipes :

I claim providing the spindle, or shaft, A, of stove-pipe dampers, with one or more wedge-shaped flanches, c, in combination with an elongated end, b, substantially in the manner and for the purpose set forth.

1,831.—S. R. Jones, of York, Pa., for an Improvement in Roofing :

I claim, first, In all roofs of shingles of whatever wood, the use, or application, of slates, of whatever shape, as a substitute along the sloping margins of a roof, or sloping margins of end roofs, rows of buildings of whatever kind, whether cars, houses, barns, bridges or any other structure, whereby they may, or can, be used or applied, substantially in such manner as arranged and described.

Second, I claim in all roofs of shingles, of whatever wood, the use, or application, of slates as the substitute for the long or short butts of shingles, of whatever form or size, wherever they may or can be applied to any part thereof, whether cars, houses, barns, bridges, or any other structure, wherever they may be used or applied, substantially in such manner as arranged and described.

1,832.—J. T. Large, of Brooklyn, N. Y., for an Improvement in Barometers :

I claim the arrangement and combination of the elastic cistern-bag, F, acorn-shaped knob, W, lever, A, thumb-screw, B, slot, C, and notches, f g, substantially in the manner and for the purpose specified.

1,833.—J. E. Marshall, of West Chester, Pa., for an Improved Halter for Horses :

I claim combining with the halter straps, a a′, b b′ and c, the loop, h, chin-strap, g, eyes, e f, loop, d, and the neck-loop, j, arranged substantially as and for the purpose set forth.

[The object of this invention is to construct a halter in such a manner that it will enable almost any person to hold and subdue vicious horses, or horses accustomed to bad habits of any description, without liability of injuring the animals, or wounding them in any manner, and without subjecting the person holding the horse to danger.]

1,834.—George Meader, of Earlville, Ill., for an Improvement in Wrenches :

I claim, first, The removable toothed-jaws, G G, fitted between teeth, e e, in the rotating ratchet-head, D, as and for the purposes herein set forth.

Second, The spring-plate, J, arranged on rotating-head, D, in the relation to the jaws, G G, as and for the purpose herein shown and described.

[This invention and improvement in wrenches for loosening and tightning nuts, screw-bolts, &c., consists in combining with a circular ratchet-head, which is rotated between two rings formed on one end of the wrench stock; two removable jaws, which are fitted between racks formed on each side of a hole through the ratchet-head, and held in place by a spring dog—said jaws being so applied that they can set closer together or moved farther apart, thus adapting wrench jaws to nuts of various sizes.]

1,835.—W. T. Mills, of Kalamazoo, Mich., for an Improved Sawing Machine :

I claim the combination of the saw, F, the rod, a, the guide block, d, the grooved supports, G G, the pitmen, H and J, lever, I, and connecting-bar, K, when arranged with the frame as constructed for joint operation, in the manner and for the purpose specified.

1,836.—Adrien Muller, of Paris, France, for an Improved Furnace for Treating Zinc and other Ores :

I claim the construction, arrangement and combination of apparatus employed in the reduction or treatment of zinc and other ores, as described.

1,837.—John Pettengill, Jr., of Jackson, N. H., for an Improvement in Car Brakes :

I claim, in combination with the lever frames, E E, and shoes, D D, the bar, I, provided with oblong slots, i i, at its ends, through which pins, j j, on the trucks pass, and also provided with pulleys, h h, for the chains, H H, to pass over, whereby the bar, I, is not allowed to interfere with the movement of the car trucks.

I further claim connecting the chains, H H, to the inner ends of the lever frames, E E, by means of the rings, G G, which are fitted on the guide-rods, F F, at the inner ends of the lever frames, substantially as shown, to admit of the moving of the frames, E, with the trucks, without affecting the chains, H H, as set forth.

[This invention relates to an improved car brake of that class in which shoes are passed down upon the upper parts of the treads of the wheels. The object of this invention is to obtain a ready and powerful means for operating or applying the brake, and one which will admit of the trucks readily turning to conform to the curvature of the track; neither the car-bed nor the brake being allowed to interfere in the least therewith.]

1,838.—H. H. Reynolds, of Buffalo, N. Y., for an Improvement in Instruments for the Cure of Spermatorrhea :

I claim a spermatorrhea instrument so constructed as to combine the spiral spring, A, and pressure plates, D and E, substantially as described (with or without the cone cup, c) and having convenient straps or belts for fastening to the body.

1,839.—G. W. Sampson, of Washington, D. C., for an Improvement in Apparatus for Heating Railroads Cars with Steam :

I claim, first, The employment of link couplings embodying the principle of operation set forth, for connecting the heaters of two or more cars, and also for connecting said heaters with the exhaust of the locomotive, substantially as described.

Second, The link couplings constructed substantially as herein described.

1,840.—Reuben Shaler, of Madison, Conn., for Improvement in Projectiles for Fire Arms :

I claim providing the butt or rear end of a bullet with the flange, 2, and the concavo-convex spreading plate, 3, so arranged as to operate in connection with each other, substantially as and for the purpose set forth.

1,841.—G. B. Turrell, of New York City, for an Improvement in Beer Coolers :

I claim, first, a cooler for beer or other liquids, formed of the vertical plates, c c, in the manner set forth, and operated as specified.

Second, I claim the trough, i, provided with the screen, 4, and with the slots in the side, 3, as and for the purposes specified.

Third, I claim the arrangement of the perforated pipes, b and d, in the manner specified, when combined with the metallic sheets, c c, as and for the purposes set forth.

Fourth, I claim introducing the nipples, f f, at the ends of the plates, c c, in the manner and for the purposes specified.

1,842.—W. W. Virdin, of Baltimore, Md., for Improvement in Boat and Ferry Bridge :

I claim a connection from the main land, pier, or wharf with steamboats or any other vessel, by means of an adjustable apron or span, with or without railroad track or tracks and adjusting switch upon the same, in combination with fixed weighted lever or levers, as counterpoise, substantially as described.

I claim also the fixed weighted lever or levers constructed and arranged as set forth, when used with any movable connection from the main land pier or wharf to and upon steamboats or any other vessel.

1,843.—J. C. Wright, of Minerville, Pa., for an Improvement in Lamps :

I claim, first, The combination of the concentric conical deflectors, C and D, and sliding wick tube, E′, all constructed, arranged and operating in the manner and for the purposes shown and explained.

Second, The movable cap, H, constructed with a supporting collar, h, vertical segmental flange, h′, and oblique convex-ended deflector, h2, and used in combination with the slotted conical deflector, C, in the manner and for the purposes shown and explained.

1,844.—J. W. Hoagland (assignor to himself and Richard McMullen), of New Brunswick, N. J., for an Improvement in Pneumatic Springs :

I claim, first, Combining with the metallic box, A B, the india rubber lining or box, D, and plunger, E, substantially as and for the purposes described and represented.

Second, Combining with the hollow main plunger, E, the elastic air cushion, H, confined within a box, I, and operated by the stationary plunger, J, at each upward stroke of the main plunger, said cushion being so arranged in relation to the air chamber, C, as to keep up a supply of air to this chamber, substantially as set forth.

Third, combining with the air chamber of a self-supplying pneumatic spring the safety valve, S, spring, p, and adjustable screw cap, P, for the purposes set forth.

Fourth, Securing the main plunger, E, to the diaphragm of the rubber bag, D, by means of a tubular bolt or stem, F, provided with a valve opening in the chamber, C, as set forth.

[An illustration of this invention will be found on page 40, presen volume.]

1,845.—J. F. Whipple (assignor to the Seamless Clothing Manufacturing Company), of New York City, for Improvement in Military Caps :

I claim the military cap having its crown and a cape composed of felt or other soft material, and having the said cape united with the sides of a peak of leather or other moderately stiff material, substantially as described.

1,846.—D. R. Pruden, of West Meriden, Conn., assignor to himself and C. A. Wellington, of Boston, Mass., for an Improvement in Ornamenting Hollow Articles of Metal :

I claim the method described of ornamenting the exterior of hollow articles, and which consists, substantially, in spinning the articles within the interior of a hollow die, as set forth.

[This invention relates to the production, in a less expensive manner, upon the exterior of cups or other vessels or hollow articles of metal, of ornaments of similar character to those produced by chasing, engraving, engine-turning, and other slow and consequently expensive processes. It consists in subjecting the article to the process of spinning with a burnisher within a hollow die in which the reverse forms of the raised ornaments desired have been produced by engraving, punching, or other means.]

1,847.—S. S. Post and Andrew J. Post, of Jersey City, N. J., assignor to Andrew J. Post aforesaid and E. C. Clark, of Piermont, N. Y., for an Improvement in Lamps :

We claim, in the construction of Lamp reflectors the employment of the part or frustum, B, of a smaller paraboloid mounted in front of the paraboloid, M, and so arranged that their axes and foci coincide so as to produce the effect set forth.

RE-ISSUE.

109.—A. T. Watson, of Castleton, N. Y., for an Improved Railroad Car Spring. Patented March 20, 1860 :

I claim, first, The manner of arranging and combining the two

© 1861 SCIENTIFIC AMERICAN, INC.

spring blades, B B′, in pairs of different lengths and curves, vertically, as described, so that the curves of the blades when under pressure, will not be liable to fracture from coming to too sharp an angle.

Second, I claim the form of the casting or frame, A A, by which the springs are held in position and made to operate in the manner described.

DESIGNS.

73.—J. C. Fay, of Troy, N. Y., for a Design for the plates of a Cooking Stove.

74.—J. Gorham, G. Thurber and L. Dexter, Jr., of Providence, R. I, for a Design for the Handles of Table Spoons and Forks.

75.—J. Gorham, G. Thurber and L. Dexter, Jr., of Providence, R. I., for a Design for Spoon and Fork Handles.

76.—J. Horton and J. Martino (assignor to David Stewart and Richard Peterson), of Philadelphia, Pa., for a Design for the Plates of a Parlor Stove.

77.—Jas. Horton and J. Martino (assignor to David Stewart and Richard Peterson), of Philadelphia, Pa., for a Design for the Plates of a Cooking Stove.

78.—E.J. Ney (assignor to the Lowell Manufacturing Co.), of Lowell, Mass., for ten patents for Designs for Carpet Patterns.

88.—Garrettson Smith and H. Brown (assignor to North, Chase and North), of Philadelphia, Pa., for Designs for Iron Doors.

89.—Nancy D. Terry, of Providence, R. I., for Design for Bonnets.

Notes and Queries

A. F. W., of Wis.—A column of water twenty feet high has just twice the power of one ten feet high. The velocity of falling water is in proportion to the square root of the height. The power of a fall of water is in proportion to the perpendicular height of the fall and the quantity of water passing over it per second.

Z. Y. Q., of N. Y.—A little sweet oil spread over the surface of varnished furniture, then rubbed until the wood is perfectly dry with a piece of soft silk, gives the surface a beautiful glossy appearance.

C. S. R., of N. J.—The cadets at West Point are appointed on the recommendation of members of Congress and the President of the United States. The entire number is limited to 250. The course of instruction is limited to five years, and each graduate is expected to spend 8 years in the public service. Tuition and clothing are provided by government; and the system of education is very rigid and perfect. A large proportion of the youth who enter are obliged to withdraw before their term expires, owing to the rigid discipline, and over study and practice.

C. D., of Mass.—A varnish made of asphalt dissolved in quick-drying linseed oil is the best that is known to us for putting on rough castings. It will not readily soften with oil if it is allowed to dry perfectly.

G. L., of N. Y.—Lilacs and purple colors dyed with cudbear are all liable to fade by exposure to the sun. A little urine is superior to saleratus for extracting the coloring matter from cudbear; alum is not required as mordant for the color.

J. T., of Ind.—Thank you for renewing your subscription. Should think you would be likely to find a customer for your gun stocks by advertising them in our columns.

C. S. I., of Ind.—Revolving and vibratory buckets on paddle-wheels are so often brought before the public we are surprised that you should think your invention a novelty. In previous volumes of the Scientific American you will find illustrations of a number of wheels with movable buckets.

F. H. W., of Mass.—We do not think the twine-box illustrated in our issue of two weeks ago was made in this country, but it is a good thing, and we should think some manufacturer would do well to make them.

S. B., of Pa.—We advise you to use stone-ware, wooden orcement tubing in preference to lead. There is always danger in the use of lead for culinary purposes.

W. S. T., of Ill.—The new signal lights which have been experimented with at Boston are not electrical flashes, as described in your letters patent, but flashes of calcium light, produced by sliding screens to represent dots, spaces and dashes, as in the Morse telegraph.

H. de K., of N. Y.—A patent was taken out April 24th, 1852, by W. C. C., Goddard and E. Middleton, London, for converting smooth-bored muskets into rifles by inserting and securing rifled tubes in them.

E. T., of Mass.—The person to whom you refer, who had the rifle described on page 58, present volume of the Scientific American, had a cone-wrench, unscrewed the nipple and put in a small charge to start the bullet, but it failed to do it.

E. S., of N. H.—Printers ink-rollers are made of a composition of glue and molasses.

W. F. B., of Ill.—You can obtain thin cast-iron pipe, we believe, of Moore & Hamilton, Toledo, Ohio, which may suit your purpose.

W. K. L., of Ill.—A solution of the sulphate of copper, or a wash of thin lime, will render shingles partially fire-proof and more durable.

C. D. P., of Maine.—You will never have a better time to apply for a patent than the present. The Patent Office was never in more efficient working order than it is now, while the applicants for patents are much less than usual, and therefore cases are more speedily acted upon than in ordinary times. Some cases had been ordered to issue latterly which had not been on file in its office more than ten days.

J. G., of Pa.—Smith & Wesson's copper cartridge for breech-loading firearms is patented. The volcanic bullet which has its charge in the rear end confined in a copper can, is also patented.

Money Received

At the Scientific American Office on account of Patent

Office business, during two weeks preceding Wednesday, July 31, 1861:—

H. & J., of Conn., $15; W. W., of Wis., $15; W. J. C., of N. Y., $43; S. C., Jr., of Maine, $18; E. H. E., of Mass., $40; F. K. M., of N. Y., $15; W. McI., of Ill., $20; H. Van D., of N. Y., $10; L. H. O., of N. Y., $25; W. H., of Pa., $30; J. H. M., of Wis., $15; G. H. M., of Mass., $15; H. C., of Maine, $25; J. H. L., of N. J., $55; W. F., of Iowa, $25; W. L. G., of N. Y., $25; J. W. C., of Mich., $20; E. R. M., of N. J., $20; J. E. D., of Mich., $20; R. J. P., of N. Y., $80; W. M. M., of Ill., $20; W. H., of Ohio, $20; T. B. & R. N. R., of Ill., $20; J. M., of Ind., $20; E. T. De V., of N. Y., $25; W. H. S., of N. Y., $25; J. J. C., of N. Y., $25; O. & S., of Mass., $10; E. M., of N. Y., $10; J. W. F., of Ill., $15; D. M. C., of Ind., $25; J. A. De B., of N. Y., $35; G. J. & H. W. R., of N. Y., $40; C. M. H. W., of N. Y., $40; T. F., of Mass., $25; P. F., of Pa., $25; N. B., of ——, $35; C. F. L., of Pa., $25; A. A., of Ohio, $40; H. G. L., of N. Y., $25; J. H. B., of N. Y., $300; J. G., of N. Y., $10; F. H., of Mass., $250; S. D. C., of Conn., $20; S. M. S., of Iowa, $20; J. C. S., of Mass., $20; N. H. B., of Mass., $20; J. T., of Cal., $60; W. D. L., of N. Y., $20; T. G. E., of Mo., $45; A. M. O., of Wis., $20; J. B. Van D., of N. Y., $25; G. & B., of N. Y., $25; B. & B., of Pa., $30; J. H. S., of Pa., $15; C. P. L., of Pa., $15; H. S. C., of N. Y., $15; T. R., of N. Y., $250; W. S., of N. Y., $30; J. R. T., of Wis., $15; J. H. S., of N. Y., $40; L. C. W., of N. Y., $15; W. H. G., of Pa., $15; J. M., of N. Y., $15; E. A. M., of N. Y., $40; J. B., of N. Y., $43; E. H. C., of Mich., $45; A. W., of Vt., $20; M. L. G., of Ill., $20; B. M., of Ind., $20; D. P. F., of Mass., $20; I. B. V., of N. J., $45; G. W. B., of N. Y., $20; C. M. N. W., of N. Y., $25; R. P., of N. Y., $25; L. K., of N. Y., $25; J. M., of Iowa, $215; H. Q. H., of N. Y., $12; G. W. Van B., of Wis., $25; J. P., of N. Y., $40.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office from July 17 to Wednesday, July 31, 1861:—

W. J. C., of N. Y.; I. J. C., of N. Y.; L. H. O., of N. Y.; C. F. L., of Pa.; L. K., of N. Y.; E. T. De V., of N. Y.; E. H. E., of Mass.; W. F., of Iowa; R. J. P., of N. Y. (2 cases); R. P., of N. Y.; D. M. C., of Ind.; P. F., of Pa.; C. F. B., of R. I.; L. F. A. L., of Cal.; J. B. Van D., of N. Y.; C. M. N. W., of N. Y.; F. J. B., of Wis.; K. H. C. P., of N. Y.; J. M., of Iowa; H. Van De W., of N, Y.; W. S., of N. Y.; P. C., of N. Y.; T. F., of Mass.; G. & B., of N. Y.; W. H., of Pa.; J. H., of Ohio; H. C., of Maine; H. G. L., of N. Y.; W. H. S., of N. Y.; W. H. B., of Mass.; J. H. L., of N. J.: A. H. B., of N. Y.; J. A. De B., of N. Y.; G. J. & H. W. R., of N. Y.; W. L. G., of N. Y.; E. A. M., of N. Y.; G. W. Van B., of Wis.

TO OUR READERS.

Models are required to accompany applications for Patents under the new law, the same as formerly, except on Design Patents, when two good drawings are all that is required to accompany the petition, specification and oath, except the government fee.

Invariable Rule.—It is an established rule of this office to stop sending the paper when the time for which it was pre-paid has expired.

New Pamphlets in German.—We have just issued a revised edition of our pamphlet of *Instructions to Inventors*, containing a digest of the fees required under the new Patent Law, &c., printed in the German language, which persons can have gratis upon application to this office. Address MUNN & CO.,

No. 37 Park-row, New York.

INSTRUCTIONS ABOUT EUROPEAN PATENTS,

With a Synopsis of the Patent Laws of the Various Countries.

AMERICAN INVENTORS SHOULD BEAR IN MIND that, as a general rule, any invention which is valuable to the patentee in this ountry is worth equally as much in England and some other foreign countries. Four patents—American, English, French and Belgian—will secure an inventor exclusive monopoly to his discovery among 100,000,000 of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The majority of all patents taken out by Americans in foreign countries are obtained through the Scientific American Patent Agency. We have established agencies at all the principal European seats of government, and obtain patents in Great Britain, France, Belgium, Prussia, Austria, Spain, &c., with promptness and dispatch.

It is generally much better to apply for foreign patents simultaneously with the application here; or, if this cannot be conveniently done, as little time as possible should be lost after the patent is issued, as the laws in some foreign countries allow patents to any one who first makes the application, and in this way many inventors are deprived of valid patents for their own inventions.

Many valuable inventions are yearly introduced into Europe from the United State, by parties ever on the alert to pick up whatever they can lay their hands upon which may seem useful.

Models are not required in any European country, but the utmost care and experience is necessary in the preparation of each case.

GREAT BRITAIN.

Patents for inventions under the new law, as amended by the act of Oct. 1, 1852, and now in operation, include the United Kingdom of Great Britain and Ireland in one grant, which confers the exclusive right to make, use, exercise or vend. This is conceded to the inventor, or the introducer, for a period of fourteen years, subject, after the patent is granted, and the first expenses paid, to a government tax twice during its existence—once within three years, and once again within seven. The purchaser of a patent would assume the payment of these taxes.

There is no provision in the English law requiring that a patented invention shall be introduced into public use within any specified limit. Under the Patent Act of October, 1852, the British government relinquished its right to grant patents for any of its colonies, each colony being permitted to regulate its own patent system. If a patent has been previously taken out in a foreign country, the British patent will expire with it.

FRANCE.

Patents in France are granted for a term of fifteen years, unless the invention has been previously secured by patent in some other country; in such case, it must take date with and expire with the previous patent. After the patent is issued, the French government requires the payment of a small tax each year so long as the patent is kept alive, and two years' time is given to put the invention patented into practice.

It should be borne in mind that, although the French law does not require that the applicant should make oath to his papers, yet if a patent should be obtained by any other person than the inventor, upon proof being adduced to this effect before the proper tribunal, the patent would be declared illegal.

BELGIUM.

Patents in Belgium are granted for twenty years, or if previously patented in another country, they expire with the date thereof. The working of the invention must take place within one year from date of patent; but an extension for an additional year may be obtained on application to the proper authorities. Inventors are only legally entitled to take out patents.

THE NETHERLANDS.

Patents are granted by the Royal Institute of the Netherlands to natives or foreigners represented by a resident subject, which extend to a period of about two years, within which time the invention must be brought into use, and upon payment of an additional tax, a patent will be granted to complete its whole term of fifteen years. Unless these conditions are complied with, the patent ceases.

PRUSSIA.

Applications for patents in Prussia are examined by the Royal Polytechnic Commission, and unless there is novelty in the invention, the applicant's petition will be denied; and if it is granted, the invention must be worked within six months afterward. A respite, however, of six additional months may be obtained, if good and sufficient reasons for it can be shown.

AUSTRIA.

Austrian patents are granted for a term of fifteen years, upon the payment of 1,000 florins, or about $500 in American currency. This sum, however, is not all required to be paid in advance. It is usual to pay the tax for the first five years upon the deposit of the papers, and the patent must be worked within its first year. The Emperor can extend the patent and privilege of working by special grant. In order to obtain a patent in Austria, an authenticated copy of the original Letters Patent must be produced.

SPAIN.

The duration of a Spanish patent of importation is five years, and can be prolonged to ten years; and the invention is to be worked within one year and one day.

To obtain a Cuban patent requires a special application and an extra charge.

RUSSIA.

Since the close of the Crimean war, considerable attention has been given to Russian patents by Americans. Russia is a country rich in mineral and agricultural products, and there seems to be a field open for certain kinds of improvements. The present Emperor is very liberally disposed toward inventors, and as an evidence of the interest which he takes in the progress of mechanic arts, we may state that we have had visits from two distinguished Russian *savans*, specially sent out by the Emperor to examine Amdrican inventions. As Russian patents are expensive, and somewhat difficult to obtain, we do not take it upon ourselves to advise applications; inventors must judge for themselves; and this remark applies not only to Russia, but also to all other foreign countries.

CANADA.

Patents of invention are granted only to actual residents of Canada and British subjects. Under the general Patent Law of Canada, an American cannot procure a patent for his invention there. The only way in which he can do so is by virtue of a special act of Parliament, which is very difficult, uncertain, and expensive to obtain. Several zealous friends of reform in Canada are working earnestly to bring about a reciprocal law, but their efforts have thus far proved fruitless.

BRITISH INDIA.

The date of the law, Feb. 28, 856; duration of a patent, fourteen years. Invention must be worked within two years from date of petition. Privilege granted only to the original inventor or his authorized agent in India.

SAXONY.

Duration of patent, from five to ten years. Invention must be worked within one year from date of grant. Careful examination made before granting a patent.

HANOVER.

Duration of patent, ten years; and in case of foreign patent having been previously obtained, an authenticated copy of said patent must be produced. Invention must be worked within six months from date of grant.

SARDINIA.

Duration of patent, from one to fifteen years. Patents for five years or less must be worked within one year, and all others within two years.

NORWAY AND SWEDEN.

Duration of patent, three years, at least; fifteen at most, according to the nature and importance of the invention. Patents for foreign inventions not to exceed the term granted abroad, and to be worked within one, two or four years.

AUSTRALIA.

Date of law, March 31, 1854. Careful examination made by competent persons previous to issue of patent, which, when granted, extends to fourteen years. Imported inventions are valid according to duration of foreign patent. It would require from twelve to eighteen months to procure a patent from the Australian government.

Parties holding foreign patents secured through our agency will be notified from time to time of the condition of their cases.

GENERAL REMARKS.

While it is true of most of the European countries herein specified, that the system of examination is not so rigid as that practised in this country, yet it is vastly important that inventors should have their papers prepared only by the most competent solicitors, in order that they may stand the test of a searching legal examination; as it is a common practice when a patentee finds a purchaser for his invention for the latter to cause such examination to be made before he will accept the title.

It is also very unsafe to entrust a useful invention to any other than a solicitor of known integrity and ability. Inventors should beware of speculators, whether in the guise of patent agents or patent brokers, as they cannot ordinarily be trusted with valuable inventions.

Messrs. MUNN & CO. have been established *fifteen years* as American and Foreign Patent Attorneys and publishers of the Scientific American, and during this time they have been entrusted with some of the most important inventions of the age; and it is a matter of pardonable pride in them to state that not a single case can be adduced in which they have ever betrayed the important trust committed to their care. Their agents in London, Paris, and other Continental cities, are among the oldest and most reliable Patent Solicitors in Europe, and they will have no connection with any other.

Caution.—It has become a somewhat common practice for agents located in England to send out circulars soliciting the patronage of American inventors. We caution the latter against heeding such applications, or they may otherwise fall into the hands of irresponsible parties, and thus be defrauded of their rights. It is much safer for inventors to entrust their cases to the care of a competent, reliable agent at home.

Fees.—The fees required by us for the preparation of foreign applications are not the same in every case; as, in some instances, when the inventions are of a complicated character, we are obliged to charge a higher fee. Applicants can always depend, however, upon our best terms, and can learn all particulars upon application, either in person or by letter.

Parties desiring to procure patents in Europe can correspond with the undersigned, and obtain all the necessary advice and information respecting the expenses of obtaining foreign patents.

All letters should be addressed o Messrs. MUNN & CO., No. 37 Park-row, New York.

© 1861 SCIENTIFIC AMERICAN, INC.

CHANGE IN THE PATENT LAWS.

NEW ARRANGEMENTS---PATENTS GRANTED FOR SEVENTEEN YEARS.

The new Patent Laws, recently enacted by Congress, are now in full force, and promise to be of great benefit to all parties who are concerned in new inventions.

The duration of patents granted under the new act is prolonged to SEVENTEEN years, and the government fee required on filing an application for a patent is reduced from **$30** down to **$15**. Other changes the fees are also made as follows :—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Re-issue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing Disclaimer	$10
On filing application for Design, three and a half years	$10
On filing application for Design, seven years	$15
On filing application for Design, fourteen years	$30

The law abolishes discrimination in fees required of foreigners, except in reference to such countries as discriminate against citizens of the United States—thus allowing English, French, Belgian, Austrian, Russian, Spanish, and all other foreigners except the Canadians, to enjoy all the privileges of our patent system (except in cases of designs) on the above terms.

During the last sixteen years, the business of procuring Patents for new inventions in the United States and all foreign countries has been conducted by Messrs. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN ; and as an evidence of the confidence reposed in our Agency by the Inventors throughout the country, we would state that we have acted as agents for more than FIFTEEN THOUSAND Inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of Inventors and Patentees, at home and abroad. Thousands of Inventors for whom we have taken out Patents have addressed to us most flattering estimonials for the services we have rendered them, and the wealth which has inured to the Inventors whose Patents were secured through this Office, and afterward illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! We would state that we never had a more efficient corps of Draughtsmen and Specification Writers than are employed at present in our extensive Offices, and we are prepared to attend to Patent business of all kinds in the quickest time and on the most liberal terms.

Testimonials.

The annexed letters, from the last three Commissioner of Patents, we commend to the perusal of all persons interested in obtaining Patents:—

Messrs. MUNN & Co. :—I take pleasure in stating that, while I held the office of Commissioner of Patents, MORE THAN ONE-FOURTH OF ALL THE BUSINESS OF THE OFFICE CAME THROUGH YOUR HANDS. I have no doubt that the public confidence thus indicated has been fully deserved, as I have always observed, in all your intercourse with the Office, a marked degree of promptness, skill and fidelity to the interests of your employers. Yours, very truly,

CHAS. MASON.

Immediately after the appointment of Mr. Holt to the office of Postmaster-General of the United States, he addressed to us the subjoined very gratifying testimonial:—

Messrs. MUNN & Co.:—It affords me much pleasure to bear testimony to the able and efficient manner in which you have discharged your duties of Solicitors of Patents while I had the honor of holding the office of Commissioner. Your business was very large, and you sustained (and, I doubt not, justly deserved) the reputation of energy, marked ability and uncompromising fidelity in performing your professional engagements. Very respectfully,

Your obedient servant, J. HOLT.

MESSRS. MUNN & Co.:—Gentleman: It gives me much pleasure to say that, during the time of my holding the office of Commissioner of Patents, a very large proportion of the business of inventors before the Patent Office was transacted through your agency, and that I have ever found you faithful and devoted to the interests of your clients, as well as eminently qualified to perform the duties of Patent Attorneys with skill and accuracy. Very respectfully,

Your obedient servant, WM. D. BISHOP.

The Examination of Inventions.

Persons having conceived an idea which they think may be patentable, are advised to make a sketch or model of their invention, and submit it to us, with a full description, for advice. The points of novelty are carefully examined, and a reply written corresponding with the facts, free of charge. Address MUNN & CO., No. 37 Park-row, New York.

Preliminary Examinations at the Patent Office.

The advice we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a Patent, &c., made up and mailed to the Inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh-streets, Washington, by experienced and competent persons. Over 1,500 of these examinations were made last year through this Office, and as a measure of prudence and economy, we usually advise Inventors to have a preliminary examination made. Address MUNN & CO., No. 37 Park-row, New York.

Caveats.

Persons desiring to file a Caveat can have the papers prepared in the shortest time by sending a sketch and description of the invention. The government fee for a Caveat, under the new law, is $10. A pamphlet of advice regarding applications for Patents and Caveats furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row New York.

How to Make an Application for a Patent.

Every applicant for a Patent must furnish a model of his invention, if susceptible of one; or if the invention is a chemical production, he must furnish samples of the ingredients of which his composition is composed, for the Patent Office. These should be securely packed, the Inventor's name marked on them, and sent, with the government fee, by express. The express charge should be prepaid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to the order of Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but if not convenient to do so, there is but little risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN & Co., No. 37 Park-row, New York.

Rejected Applications.

We are prepared to undertake the investigation and prosecution of rejected cases, on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief history of their case, inclosing the official letters, &c.

Foreign Patents.

We are very extensively engaged in the preparation and securing of Patents in the various European countries. For the transaction of this business, we have offices at Nos. 66 Chancery-lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that THREE-FOURTHS of all the European Patents secured to American citizens are procured through our Agency.

Inventors will do well to bear in mind that the English law does not limit the issue of Patents to Inventors. Any one can take out a Patent there.

Circulars of information concerning the proper course to be pursued in obtaining Patents in foreign countries through our Agency, the requirements of different Patent Offices, &c., may be had gratis upon application at our principal office, No. 37 Park-row, New York, or either of our Branch Offices.

Interferences.

We offer our services to examine witnesses in cases of interference, o prepare arguments, and appear before the Commissioner of Patents or in the United States Court, as counsel in conducting interferences or appeals.

For further information, send for a copy of "*Hints to Inventors.*" Furnished free. Address MUNN & CO., No. 37 Park-row, New York.

The Validity of Patents.

Persons who are about purchasing Patent property, or Patentees who are about erecting extensive works for manufacturing under their Patents, should have their claims examined carefully by competent attorneys, to see if they are not likely to infringe some existing Patent, before making large investments. Written opinions on the validity of Patents, after careful examination into the facts, can be had for a reasonable remuneration. The price for such services is always settled upon in advance, after knowing the nature of the invention and being informed of the points on which an opinion is solicited For rther particulars, address MUNN & CO., No. 37 Park-row, New York .

Extension of Patents.

Valuable Patents are annually expiring which might be extended and bring fortunes to the households of many a poor Inventor or his family. We have had much experience in procuring the extension of Patents; and, as an evidence of our success in this department, we would state that, in all our immense practice, we have lost but *two* cases, and these were unsuccessful from causes entirely beyond our control.

It is important that extension cases should be managed by attorneys of the utmost skill to insure success. All documents connected with extensions require to be carefully drawn up, as any discrepancy or untruth exhibited in the papers is very liable to defeat the application.

Of all business connected with Patents, it is most important that extensions should be intrusted only to those who have had long experience, and understand the kind of evidence to be furnished the Patent Office, and the manner of presenting it. The heirs of a deceased Patentee may apply for an extension. Parties should arrange for an application for an extension at least six months before the expiration of the Patent.

For further information as to terms and mode of procedure in obtaining an extension, address MUNN & CO., No. 37 Park-row, New York.

Assignments of Patents.

The assignment of Patents, and agreements between Patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park-row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express prepaid), should be addressed to MUNN & CO., No. 37 Park-row, New York.

RATES OF ADVERTISING.

Thirty Cents per line for each and every insertion, payable in advance. To enable all to understand how to calculate the amount they must send when they wish advertisements published, we will explain that ten words average one line. Engravings will not be admitted into our advertising columns; and, as heretofore, the publishers reserve to themselves the right to reject any advertisement sent for publication.

SWISS DRAWING INSTRUMENTS.—CATALOGUE (7TH edition), containing over 250 illustrations of Mathematical, Optical and Philosophical Instruments, with attachment of a large sheet representing the genuine Swiss Instruments, in their actual size and shape, will be delivered on application to all parts of the United States (gratis), by C. T. AMSLER, No. 635 Chestnut-street, Philadelphia, Pa., established agency for the Swiss Drawing Instruments since 1848.

Being about to retire from business, I have sold my stock of Swiss Mathematical Instruments to Messrs. McALLISTER & BROTHER, of No. 728 Chestnut street, Philadelphia, who will continue to keep such for sale, and to whom I refer my former friends and customers.

C. T. AMSLER.

Philadelphia, Pa., June 12, 1861. 1 tf

PUMPS! PUMPS!! PUMPS!!!—CARY'S IMPROVED Rotary Force Pump, unrivaled for pumping hot or cold liquids. Manufactured and sold by CARY & BRAINERD, Brockport, N. Y. Also, sold by J. C. CARY, No. 2 Astor House, New York City. 14tf

A MESSIEURS LES INVENTEURS—AVIS IMPORtant. Les Inventeurs non familiers avec la langue Anglaise et qui préféreraient nous communiquer leurs inventions en Français, peuvent nous addresser dans leur langue natale. Envoyez nous un dessin et une description concise pour notre examen. Toutes communications seront reçues en confidence. MUNN & CO.,

SCIENTIFIC AMERICAN Office, No. 37 Park-row, New York.

POPULAR LECTURES BY POPULAR MEN.

The following lectures have appeared in late numbers of the *Household Journal*, copies of which can be had, price four cents each, from any news agent, or from the publishers direct, on receipt of postage stamps :—

"The Beauties of Poetry." By Emerson Bennett, Esq. In No. 19.
"The Orator of Nature." By Rev. T. L. Cuyler. In No. 18.
"The Chemistry of the Atmosphere." By Prof. J. P. Cook, Jr. In No. 17.
"Money." By R. S. De Cordova, Esq. In No. 16.
"America West of the Mississippi." By Hon. Horace Greeley. In No. 15.
"Richard Brimsley Sheridan." By Mr. Siddons. In No. 14.
"Spanish America." By W. J. Dix, Esq. In No. 16.
"Society and its Burdens." By Rev. H. W. Beecher. In No. 12.
"The Moral Value of Washington's Character." By Rev. C. H. Fay. In No. 11.
"Algernon Sidney." By Rev. Dr. Thompson. In No. 10.
"Man and his Work." By Rev. E. H. Chapin. In No. 9.
"The Women of the Revolution." By Rev. T. Armitage. In No. 8.
"Lights and Shadows of London Life." By J. B. Gough. In No. 7.
"Italy and Garibaldi." By Colchas Hicks. In No. 6.
"The Scenery of the Andes." By W. J. Dix, Esq. In No. 5.
"The Uses of Astronomy." By Hon. Edward Everett. In No. 4.
"The Wonders of God in Nature." By. Prof. I. P. Cook, Jr. In No. 3.
"Self Help." By Timothy Titcomb, (Dr. I. J. Holland). In No. 2.
"The World's Highway,"—with Map of the World. By Dr. Solger. In No. 1.

A lecture is published every number, weekly. Annual subscriptions, $2,00 Weekly Nos., four cents. Monthly parts, 17 cents. Publishers, A. HARTHILL & CO., No. 20 North William Street, New York.
5 4

FLAX COTTON—PREMIUMS.

The Rhode Island Society for the Encouragement of Domestic Industry offer the following:

A premium of thirty dollars for a bale of not less than fifty pounds of the best prepared Flax Cotton, fit for use on cotton machinery, accompanied with a statement of its culture, production and preparation, including cost of the various processes.

A premium of twenty dollars for the second best bale of the same, on the same conditions.

The bales to be delivered at the rooms of the Society on or before Sept. 11, 1861. The premiums will be awarded by the Standing Committee at their meeting to be held on the third Wednesday in September, and paid as soon as awarded.

The Society will defray all the necessary expenses of transportation on the bales of proper size offered for premiums, and will claim the right to retain the same at their pleasure, on payment of a fair price.

The flax cotton will be open for public examination at the Exhibition of Vegetables, Fruits and Flowers, to be held by the Society at Railroad Hall, September 11, 1861. W. R. STAPLES, Sec'y.

Communications upon this subject may be addressed to the Secretary of the Society, or to either of the following persons as the Special Committee of the Society upon Flax Culture, &c.

James Y. Smith, Providence.
William Viall, "
His Excellency, William Sprague, Providence.
Bailey W. Evans, "
Robert S. Burrough, "
Edward Harris, Woonsocket, "
Elisha Dyer, Providence, Chairman.
Lyman B. Frieze, " Secretary. 4tf

IRON PLANERS, ENGINE LATHES, AND OTHER MAchinists Tools, of superior quality, on hand and finishing, and for sale low; also, Harrison's Grain Mills. For descriptive circular, address NEW HAVEN MANUFACTURING CO., New Haven, Conn.
1 26

GUILD & GARRISON'S STEAM PUMPS, FOR ALL kinds of independent steam pumping; for sale at Nos. 55 and 57 First-street, Williamsburgh, L. I., and No. 74 Beekman-street, New York. [1 26] GUILD, GARRISON & CO.

SOLID EMERY VULCANITE.—WE ARE NOW MANUfacturing wheels of this remarkable substance for cutting, grinding and polishing metals, that will outwear hundreds of the kind commonly used, and will do a much greater amount of work in the same time, and more efficiently. All interested can see them in operation at our warehouse, or circulars describing them will be furnished by mail.

NEW YORK BELTING AND PACKING CO.,
1 13 Nos. 37 and 38 Park-row, New York.

OIL! OIL! OIL!—FOR RAILROADS, STEAMERS AND for Machinery and Burning.—Pease's Improved Machinery and Burning Oil will save fifty per cent, and will not gum. This Oil possesses qualities vitally essential for lubricating and burning found in no other oil. It is offered to the public upon the most reliable, thorough and practical test. Our most skillful engineers and machinists pronounce it superior to and cheaper than any other, and the only Oil that is in all cases reliable and will not gum. The SCIENTIFIC AMERICAN, after several tests, pronounces it "superior to any other they have ever used for machinery." For sale only by the inventor and manufacturer,

F. S. PEASE,
No. 61 Main-street, Buffalo, N. Y.

N. B.—Reliable orders filled for any part of the United States and Europe. 14 13

MACHINE BELTING, STEAM PACKING, ENGINE HOSE.—The superiority of these articles, manufactured of vulcanized rubber, is established. Every belt will be warranted superior to leather, at one-third less price. The Steam Packing is made in every variety, and warranted to stand 300 degs. of heat. The Hose never needs oiling, and is warranted to stand any required pressure; together with all varieties of rubber adapted to mechanical purposes. Directions, prices, &c., can be obtained by mail or otherwise at our warehouse. NEW YORK BELTING AND PACKING COMPANY.

JOHN H. CHEEVER, Treasurer,
1 13 Nos. 37 and 38 Park-row, New York.

C. C. HOFF'S PATENT IMPROVED DEODERIZED Mastic Roofing—Patented May 14, 1861. This Roofing is carefully put up and shipped to any part of the United States, with full printed directions for use. It is adapted to steep or flat roofs; is fireproof. State and county rights for sale. Address the inventor and proprietor, C. C. HOFF, Poughkeepsie, N. Y. 3 4*

HARRISON'S GRIST MILLS—20, 30, 36 AND 48 inches diameter, at $100, $200, $300 and $400, with all the modern improvements. Also, Portable and Stationary Steam Engines of all sizes, suitable for said mills. Also, Bolters, Elevators, Belting, &c. Apply to S. C. HILLS, No. 12 Platt-street, New York. 1 e3w

GET A PUSEY HORSE-POWER GOVERNOR AND guard against accidents. Sent by express for $6. Payable on delivery. N. B.—Rights for sale. LEA PUSEY, Wilmington, Del.
23 5*eow

ALCOTT'S CONCENTRIC LATHES—FOR BROOM, Hoe and Rake Handles, Chair Rounds, &c.—Price, $25; and all other kinds of Wood-working Machinery, for sale by
3*1em S. C. HILLS, No. 12 Platt-street, New York.

Zur Beachtung für deutsche Erfinder.

Die Unterzeichneten haben eine Anleitung, die Erfindern das Verfahren angibt, um sich ihre Patente zu sichern, herausgegeben, und verabfolgen solche gratis an dieselben.

Erfinder, welche nicht mit der englischen Sprache bekannt sind, können ihre Mittheilungen in der deutschen Sprache machen. Skizzen von Erfindungen mit kurzen, deutlich geschriebenen Beschreibungen beliebe man zu addressiren an

Munn & Co.,
37 Park Row, New-York.

Auf der Office wird deutsch gesprochen.

Daselbst ist zu haben :

Die Patent-Gesetze der Vereinigten Staaten,

nebst den Regeln und der Geschäftsordnung der Patent-Office und Anleitungen für den Erfinder, um sich Patente zu sichern, in den Ver. St. sowohl als in Europa. Ferner Auszüge aus den Patent-Gesetzen fremder Länder und darauf bezügliche Rathschläge; ebenfalls nützliche Winke für Erfinder und solche, welche patentiren wollen.

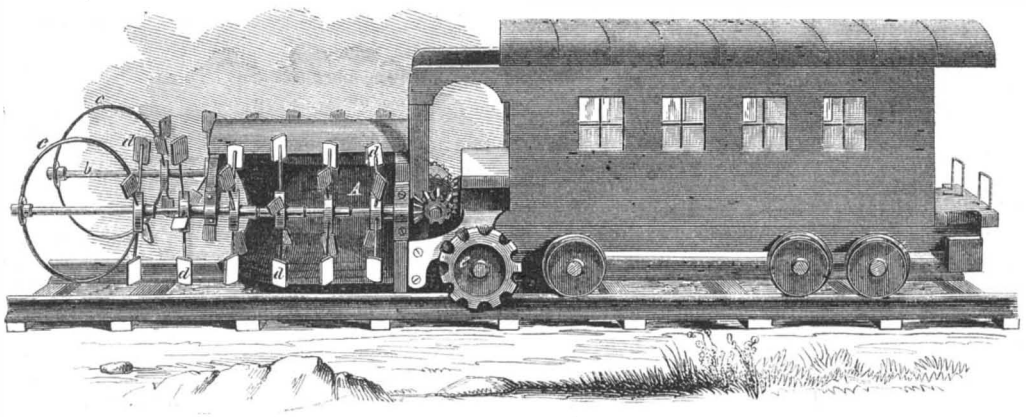
Preis 20 Cts., per Post 25 Cts.

© 1861 SCIENTIFIC AMERICAN, INC.

Improved Snow Plow and Ice Breaker.

To a person who has never spent a winter in a cold climate the clearing of a railroad track from snow when witnessed for the first time, must be a very novel and exciting scene. As the ponderous iron horse plows his way through the pure white deposit that covers the earth, his hot breath falling in showers of frost by his side, and the two wreaths of snow curling from the mold boards of the plow before him, an element of grace and beauty is added to his ordinary exhibition of strength and power. But when a deep drift is encountered the scene changes at one step from the sublime to the ridiculous. The locomotive is drawn back and driven with all force into the drift—always suggesting the idea of an irrate ram butting into a hay stack.

When we first saw a snow plow we thought it was perfect ; but it seems that perfection is not written on the works of man. We here illustrate an invention designed to enable the snow plow to operate with more ease and efficiency, and at the same time, to clear the track from any ice that may have formed upon it.



STEINHAUSER'S SNOW PLOW AND ICE BREAKER.

It is an addition to the ordinary snow plow, and is very clearly shown in the cut. Along each side of the plow, A, is placed a shaft, *b b*, to be rotated by the engine. Upon the forward ends of these shafts are secured flat hoops, *c c* ; the shafts rotating in the directions to carry the lower parts of these hoops outward from the middle of the track. At intervals, along the shafts, spokes are rigidly inserted, with shovel blades, *d d d d*, at their ends ; these blades being set at such angles as to correspond with a spiral curve winding around the shaft.

As the shafts revolve, the hoops first break the snow, and then the shovels throw it away clear from the track.

At the rear end of the plow are the ice breakers or cutters. These consist of a series of heavy wheels, three for each track ; the middle wheel having teeth similar to cogs to run upon the upper surface of the rail, while the two cutter wheels, *e*, have sharp cutting scolloped edges to cut the ice on the side of the rails. These wheels are intended to be so attached that they may be raised to pass over turn-outs, &c.

The advantages claimed for this plow are, that it can be attached to an engine drawing a passenger train ; and that it will perform the work of a large number of men, thus effecting economy of labor.

The patent for this invention was granted February 19th, 1861, and further information in relation to it may be obtained by addressing the inventor, Frank J. Steinhauser, at Lancaster, Penn.

Relations of the Vegetable and Animal Kingdoms.

"There is a ceaseless round of force mutation throughout nature," says the *Cornhill Magazine*, "each one generating or changing into the other. So that force which enters the plant as heat and light, &c., is stored up in its tissues, making them organic. This force, transferred from the plant to the animal in digestion, is given out by its muscles in their decomposition, and produces motion, or by its nerves, and constitutes nervous force—force stored up in the body—resistance to chemical affinity ; this force proceeds directly from the solar rays." The solar rays cause those operations in the vegetable world, by which trees and plants absorb the carbonic acid gas which is expired from the lungs of animals, and by which those very plants also exhale pure oxygen gas during light, to revive the contaminated atmosphere and supply the lungs of man with the breath of life. Trees and plants are essential to the health of the animal creation, and there is a mutual relationship between the two kingdoms. Respecting these beautiful and mysterious operations of nature, a distinguished writer has given the following literary gem :—

The carbonic acid gas with which our breathing fills the air, to-morrow will be speeding north and south, striving to make the tour of the world. The date trees that grow round the fountains of the Nile will drink it in by their leaves ; the cedars of Lebanon will take of it to add to their stature ; the cocoa-nuts of Tahiti will grow riper on it; and the palms and bananas of Japan change it into flowers. The oxygen we are breathing was distilled for us some short time ago by the magnolias of the Susquehana, and the great trees that skirt the Orinoco and the Amazon; the giant rhododendrons of the Himalayas contributed to it, the roses and myrtles of Cashmere, the cinnamon trees of Ceylon, and forests older than the Flood, buried deep in the heart of Africa, far behind the Mountains of the Moon. The rain which we see descending was thawed for us out of icebergs which have watched the pole star for ages, and lotus-lilies sucked up from the Nile, and exhaled as vapor, the snows that are lying on the tops of our hills. Thus we see that the two great kingdoms of nature are made to co-operate in the execution of the same design, each ministering to the other, and preserving that due balance in the constitution of the atmosphere which adapts it to the welfare and activity of every order of beings, and which would soon be destroyed were the operations of any one of them to be suspended. And yet man, in his ignorance and his thirst for worldly gain, has done his utmost to destroy this beautiful and harmonious plan. It was evidently the intention of the Creator that animal and vegetable life should everywhere exist together, so that the baneful influence which the former is constantly exercising upon the air, whose purity is so essential to its maintenance, should be counteracted by the latter.

"Will Saltpeter Explode ?"

Much stress has been laid on the assumed combustibility and explosibility of saltpeter ; but this is a mistake. Saltpeter, of itself, is wholly incombustible, far less explosive. If a parcel of saltpeter be confined in an iron box —a safe, for example, and the box heated to redness externally, no combustion could ensue ; and though gaseous pressure would result, there could be no igneous explosion. It is only when saltpeter is mingled with combustible matter, as in gunpowder, or brought in close propinquity with combustible matter, as it may in the ordinary storage of a warehouse, that combustion, independent of the presence of atmospheric air, and if that combustion be rapid, explosion can ensue. It is nothing new to be told that vegetable fiber, such as jute and hemp, if packed tightly together, is always subject to heating ; that heating once established, the risk of spontaneous combustion is imminent. This may occur at any time, but more particularly is the result liable to occur in hot weather. If oily or greasy bodies come in contact with the vegetable matter, and are absorbed by it, the chances of spontaneous combustion are still more imminent ; and spontaneous combustion once established, the best chance of speedy extinction would consist in absolutely cutting off all air supply from without. This is a provision which can, however, only be effected under the one limiting condition that no supporter of combustion, no oxygen-yielding material, that is to say, be present within. An iron safe filled with mingled saltpeter and jute, hemp, or other vegetable matter, if made red hot externally, would explode very much after the fashion of a gunpowder magazine ; gunpowder, in point of fact, the mixture would be, all save the presence of sulphur, an agent which only improves the explosive nature of gunpowder to some trifling degree. The conditions reflected on, is there any practical necessity, we would now ask, for vegetable fibers, such as hemp and jute, to be baled in close propinquity with greasy or oleagenous matters ? Is it further necessary, assuming such dangerous propinquity inevitable, that means of internal combustion be supplied by the intervention of saltpeter ? To our apprehension, a wharehouse filled with hemp or jute, oil and saltpeter, mingled together, is in some respects more pregnant with danger than a gunpowder magazine. Gunpowder never spontaneously ignites, whereas vegetable fibers often do, even though oil be not mingled with them ; add saltpeter, and the conditions favoring explosive combustibility are complete.

THE great iron-cased frigate *Warrior* will be ready for her trial trip this month. On the upper deck a rifle tower is being erected, the four corners of which are to be protected with Armstrong guns. A small steam engine is to be used on board for working a fan to drive off the smoke of the guns from the deck.

PROSPECTUS

THE

SCIENTIFIC AMERICAN.

THE BEST MECHANICAL PAPER IN THE WORLD

SEVENTEENTH YEAR.

VOLUME V.—NEW SERIES.

A new volume of this widely circulated paper commenced on the 6th of July. Every number contains sixteen pages of useful information, and from five to ten original engravings of new inventions and discoveries, all of which are prepared expressly for its columns.

The SCIENTIFIC AMERICAN is devoted to the interests of Popular Science, the Mechanic Arts, Manufactures, Inventions, Agriculture, Commerce and the Industrial Pursuits generally, and is valuable and instructive not only in the Workshop and Manufactory, but also in the Household, the Library and ths Reading Eoom.

The SCIENTIFIC AMERICAN has the reputation, at home and abroad, of being the best weekly publication devoted to mechanical and industrial pursuits now published, and the publishers are determined to keep up the reputation they have earned during the SIXTEEN YEARS they have been connected with its publication.

To the Inventor !

The SCIENTIFIC AMERICAN is indispensable to every inventor, as it not only contains illustrated descriptions of nearly all the best inventions as they come out, but each number contains an Official List of the Claims of all the Patents issued from the United States Patent Office during the week previous ; thus giving a correct history of the progress of inventions in this country. We are also receiving, every week the best scientific journals of Great Britain, France, and Germany ; thus placing in our possession all that is transpiring in mechanical science and art in these old countries. We shall continue to transfer to our columns copious extracts from these journals of whatever we may deem of interest to our readers.

To the Mechanic and Manufacturer !

No person engaged in any of the mechanical pursuits should think of "doing without" the SCIENTIFIC AMERICAN. It costs but four cents per week ; every number contains from six to ten engravings of new machines and inventions, which cannot be found in any other publication It is an established rule of the publishers to insert none but original engravings, and those of the first-class in the art, drawn and engraved by experienced persons under their own supervision.

Chemists. Architects, Millwrights and Farmers !

The SCIENTIFIC AMERICAN will be found a most useful journa to them. All the new discoveries in the science of chemistry are given in its columns, and the interesls of the architect and carpenter are not overlooked ; all the new inventions and discoveries appertaining to these pursuits being published from week to week. Useful and practical information pertaining to the interests of millwrights and millowners will be found published in the SCIENTIFIC AMERICAN which information they cannot possibly obtain from any other source. Subjects in which planters and farmers are interested will be found discussed in the SCIENTIFIC AMERICAN ; most of the improvements in agrtcultural implements being illustrated in its columns.

TERMS.

To mail subscribers:—Two Dollars a Year, or One Dollar for six months. One Dollar pays for one complete volume of 416 pages ; two volumes comprise one year. The volumes commence on the first of JANUARY and JULY.

CLUB RATES.

Five Copies, for Six Months	$4
Ten Copies, for Six Months	$8
Ten Copies, for Twelve Months	$15
Fifteen Copies, for Twelve Months	$22
Twenty Copies, for Twelve Months	$28

For all clubs of Twenty and over, the yearly subscription is only $1.40 Names can be sent in at different times and from different Post-offices Specimen copies will be sent gratis to any part of the country.

Western and Canadian money or Post-office stamps taken at par for subscriptions. Canadian subscribers will please to remit 25 cents extra on each year's subscription to pre-pay postage.

MUNN & CO., Publishers,
No. 37 Park-row, New York.

FROM THE STEAM PRESS OF JOHN A. GRAY.

© 1861 SCIENTIFIC AMERICAN, INC.